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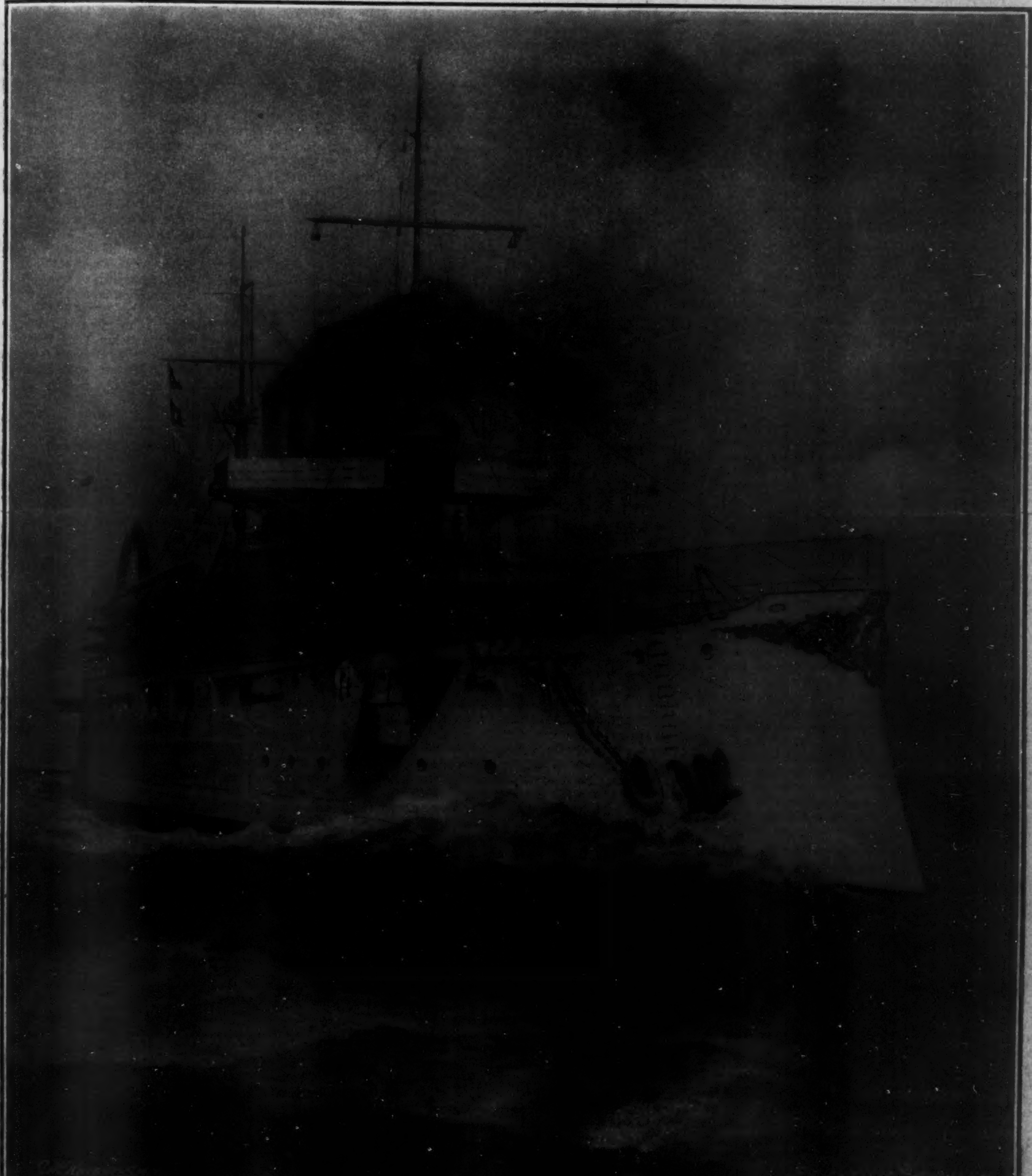

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THE NEW ARMORED CRUISER "TENNESSEE."—[See page 230.]

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NEW YORK, SATURDAY, MARCH 17, 1906.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

DIVERSION OF NIAGARA RIVER.

Thanks to the initiative of the Merchants' Association of New York, acting in conjunction with the American Civic Association, it is likely that the preservation of Niagara Falls will be made a matter of joint international control. The President of the United States has expressed his great interest in the subject and favorable opinions have been obtained from former Attorney-General Griggs, Attorney-General Moody, and former Attorney-General Knox. The concurrence of these opinions leaves no doubt that the necessary action must take the form of a treaty between the United States and Great Britain, a point of view which seems to be shared by the authorities on the Canadian side of the border. Former Attorney-General Griggs expressed the opinion that whatever jurisdiction the State of New York has over the waters of the river and their use, is subject to the power of the national government, in two respects: First, with respect to navigation, as to which the laws of Congress are supreme; and second, as to the subject of boundary between this State and Canada, in respect to which the United States and Great Britain have the right by treaty stipulation to impose such conditions and regulations upon the use of the river and its waters as they deem mutually proper.

The ethics of this question of the preservation of Niagara Falls are very simple; for it resolves itself into a contest between the claims of a few people who see in the stored energies of the Falls a means of producing merchantable electric power more cheaply than it can be produced by an ordinary steam plant, and the interests of those unnumbered thousands the world over who, if they visit the Western Hemisphere, set down a visit to Niagara Falls as one of the indispensable features of their programme of travel. The widespread sympathy with the movement to protect this majestic and most beautiful spectacle of nature is a refreshing sign that mercenary and utilitarian considerations have not obtained the absolute sway, which the trend of recent events has seemed to suggest.

TWO IMPORTANT TUNNEL PROPOSALS.

Some of our more important railroads are considering the question of reducing the height of the summit elevations on the main line of their systems by the construction of lengthy tunnels. According to recent dispatches, the Pennsylvania Railroad Company is about to lower the summit of the Alleghany Mountain division by driving a great tunnel, which will be either 9 miles or 11 miles in length, according as one or other of two alternative surveys is adopted. On the eastern slope the road would enter the tunnel in the vicinity of the Horseshoe Curve; on the western slope the portal would be in the neighborhood of Crescent. At present, the enormously heavy traffic of this road has to be hauled over a summit which is 2,160 feet above mean sea level, and by the construction of the tunnel, this would be cut down probably to about 1,500 feet. The importance of the reduction is not shown by the mere statement of reduction of vertical height; for on the eastern slope the grade is particularly steep, and the portion of the summit line that would be eliminated has an average grade, we believe, of something like two per cent. Another road, which has an important tunnel under consideration, is the Lehigh Valley Railroad, which by a change in the location of its line, and the construction of seven miles of tunnel through the mountain range in which the Lehigh River has its source, will eliminate many miles of heavy grade and reduce its summit elevation by several hundred feet.

STEAM TURBINE ECONOMY.

Rooted prejudices die hard, even in a field of effort as barren of sentiment and so essentially practical as that of steam engineering. In proof of this, witness the belief, which even to-day is held by many engineers, that the steam turbine requires an extravagant amount of steam and increases the coal bill to an extent that more than neutralizes its other economies in space, weight, and labor. As far as our observation is a guide, the only conditions under which the steam turbine has failed to show a marked economy over the reciprocating engine are those in which the speed of revolution has to be cut down in order to accommodate certain speed conditions imposed by the nature of the work that is to be done. The one case in which this has occurred has been in the application of the steam turbine to ocean liners of the largest size, in which the design of the propeller governs the design of the turbine. The rather low (for a turbine) speed of revolution increases the size of the turbine to a point at which it does not as yet appear to be able to show the remarkable efficiency which has been achieved by the marine steam turbine in vessels of moderate dimensions. With this exception, the data of turbine performance which are at hand prove that it is markedly superior, compared on a basis of steam consumption, to the reciprocating engine, when both are doing similar duty. This is true of the steam turbine when used in stationary plants, irrespective of its size, and it is also true of the marine steam turbine until it comes to be built in sizes of 10,000 horse-power and over. In one of the largest central power stations recently erected in this city the turbines, which are of 7,500 horse-power capacity, were built under a guaranteed steam consumption, when using 175-pound dry saturated steam at the throttle, of 11.47 pounds of steam per horse-power hour. This may be compared with the guarantee given for reciprocating engines of the same capacity in another large power house in this city, which was 12.25 pounds per horse-power per hour.

A most significant proof of the strong confidence which marine engine builders have in the steam economy of the turbine, has lately been afforded in connection with the letting of a contract for an 18-knot mail steamer for the Roumania State Railway service. The specifications called for a 1,500-ton steamer driven by twin-screw engines of 7,000 indicated horse-power. The contract requirements were extremely severe, and heavy penalties were provided for. It was stipulated that with reciprocating engines the consumption should not exceed 1.454 pounds of coal per indicated horse-power per hour, which works out for the given horse-power and speed at 10,801 pounds per hour. Among the designs was one for a triple-screw vessel driven by Parsons steam turbines, for which the bidders guaranteed a coal consumption of 7,716 pounds per hour. Here, then, was a firm which was prepared to guarantee for its alternative design with turbines a fuel consumption less by 30 per cent than the maximum allowed by the railroad for reciprocating engines of the same horse-power.

THE SHIPPING BILL IN A NUTSHELL.

Since there appears to be some uncertainty as to the present status of the shipping bill framed by the President's Merchant Marine Commission, we give the following digest of this important measure. The provisions of the bill are as follows: First, the creation of a volunteer naval reserve of 10,000 officers and men of the merchant marine and fisheries, trained in gunnery, etc., subject to the call of the President in war, and receiving retainer bounties as 33,500 British naval reserve men do.

Second, subventions at the rate of $5 a gross ton a year to all cargo vessels in the foreign trade of the United States, and to craft of the deep-sea fisheries, and $6.50 a ton to vessels engaged in our Philippine commerce—the Philippine coastwise law being postponed till 1909. But these cargo vessels in order to receive subventions must be held at the disposal of the government in war, must convey the mails free of charge, be seaworthy and efficient, carry a certain proportion of Americans and naval reserve men in their crews, and make all ordinary repairs in the United States. Ships lose their subventions if they leave our trade for that of foreign countries, or if, like the Standard Oil craft, they are not engaged exclusively as common carriers.

Third, subventions to new mail lines from the Atlantic coast to Brazil, Argentina, and South Africa; from the South Atlantic coast to Cuba; from the Gulf coast to Cuba, Brazil, Mexico, Central America, and the Isthmus of Panama; from the Pacific coast *via* Hawaii to Japan, China, and the Philippines, and to Mexico, Central America and the Isthmus of Panama, and from the North Pacific coast direct to Japan, China, and the Philippines, with increased compensation to one existing contract line from the Pacific coast *via* Hawaii and Samoa to Australasia. All ships receiving subventions must be already American by register or American-built—thus excluding the foreign-built fleet of the Atlantic Steamship Combination. Not one dollar is given to fast passenger and mail lines to Europe. Ships constructed for foreign commerce to receive these subventions can under the Dingley tariff be built, equipped, and repaired of materials imported free of duty. The maximum annual cost of the proposed mail subventions will be about $3,000,000; of the other subventions and retainers to the naval reserve, from $1,550,000 in 1907 to $5,750,000 in 1916. If tonnage taxes are increased, as originally proposed, the legislation will cost nothing the first year, but turn $616,000 into the Treasury, and the annual average net cost for ten years, with the building of new ships, will be $4,625,000. Great Britain next year will pay $6,000,000 or $7,000,000 in shipping subsidies, France $8,000,000, Italy $3,000,000, and Japan about $4,000,000. This bill was passed by the Senate on February 14, and unless the friendly attitude of the individual members of the House should give place to a collective hostility, it is likely to become a law before the close of the present session.

IS LEAD A FORM OF RADIUM?

Radio-activity is a property intrinsic to the element, and, therefore, to the atom or smallest part of the element. The radio-elements possess the heaviest known atoms. If the lightest, hydrogen, is taken as unity, uranium is 238, thorium 232, and radium 225, while the next heaviest known are the inactive elements bismuth 208, and lead 207. The element helium is the second lightest known and its atomic weight is 4. Now, if the alpha-particle is an atom of helium, the expulsion of one alpha-particle from an atom of radium will reduce its atomic weight from about 225 to 221. This must, therefore, be a new atom and represent an unknown element, for the nearest known element has the atomic weight 208.

The chemical elements run in families. Radium, for example, is the missing "big brother" of the alkaline-earth family of elements, which consists of three elements, calcium 40, strontium 87, and barium 137, and chemically radium is an almost exact copy of its nearest relation, barium. Helium, in turn, is the lightest member of a family of gaseous elements, exactly similar in chemical nature. The family forms the well-known group discovered by the joint labors of Lord Rayleigh and Sir William Ramsay. The series runs, helium 4, neon 20, argon 40, krypton 82, and xenon 128. It happens that the heavy residue of the radium atom posessing an atomic weight of about 221, left behind after the expulsion of the light helium atom, turns out to be one of the missing big brothers of helium itself, being nearly twice as heavy as the heaviest (xenon) previously known. It is new, and a gas of the same chemical nature as the others, and is produced at a steady rate from radium, one atom for every alpha-particle expelled. It is, in fact, the radium emanation.

A quantity of radium, although it is sending forth its shower of alpha-particles continuously from year to year, does not grow appreciably less. The most sensitive balance has not yet succeeded in showing any change of weight. Hence it is obvious that although the actual number of alpha-particles and of new atoms of emanation may be, indeed must be, enormous, they only represent an unrecognizably small fraction of a minute amount of radium. The radium atom turns into a new atom, the atom of the emanation, by expelling an atom of helium. If the emanation expels another helium atom another new residue atom of weight 217 will be left. This is the solid form of matter which is deposited as a film from the emanation and is the cause of the phenomenon of the imparted activity. It is called by Rutherford *radium A*, and it also is recognized solely on account of the alpha-particles it expels. So the residue from radium A is another new atom of weight 213; it is called radium B. Rutherford, as the result of a series of observations elucidated with consummate skill, has recently arrived as far as radium F, in the analysis of the later slow changes of radium. But an alpha-particle is not expelled in each case; sometimes it is the beta-ray or electron only, as in the case of the change of radium E into radium F; sometimes no radiant particle is expelled at all, and we have a *rayless* change, as for example when radium B turns into radium C, but then the next change, that of radium C into radium D, makes up by expelling both alpha- and beta-particles. Reverting to radium F we find it also gives an alpha-particle and so must change into a radium G. Now radium F, the seventh successive product of the disintegration of radium, has been shown to be the polonium of Mme. Curie, found by her as a constant companion of radium in the uranium mineral pitchblende. Polonium gives alpha-rays, but no detectable other product. We have at length reached the apparent end of the process. Radium G does not expel either alpha- or beta-particles, and so we have only a theoretical reason for believing it to exist. We can, however, make a good guess as to what radium G is. Counting the total number of helium atoms expelled in the series, we find they amount to five, or a loss of the atomic weight of 20 units, which leaves a residue

about 205. Remembering that the atomic weight of radium is uncertain to at least a unit, and that, if anything, the atomic weight of helium is likely to be less than four, it is not impossible that lead (207) may well be radium G. This is as much as can be said for the moment.

BLUE LIGHT AND ELECTRICITY AS ANÆSTHETICS.

A few months ago attention was called in these columns to a method of producing anæsthesia by means of blue light. It was not claimed for the method that it would answer for any but minor surgical operations; still it seemed sufficiently promising for the painless extraction of teeth. The patient was submerged, as it were, in a bath of blue light. The rays, it was thought, influenced the brain through the optic nerve. Perhaps there was also something of hypnosis in this supposed effect.

Dr. J. C. Watkins, a southern dentist, has conducted some experiments which have certainly added much to a true conception of the cause and effect of blue-light anæsthesia. He used the blue light, not for the extraction of teeth, but for "the reduction of swelling and the alleviation of pain." The system that he advocates is simple. It consists merely in applying the blue rays directly to the part affected.

The apparatus which he employs comprises a sixteen-candle-power blue electric-light globe arranged in a funnel-shaped tin shield which at its mouth is about four inches in diameter. This is extended about four inches, and has at its end a ground blue glass and convex lens. The ground blue glass is used to disseminate the blue rays so that the patient may not know the simplicity of the apparatus; no especial virtue is to be attributed to the lens.

A clinical history of cases which he has treated and which he has enumerated and discussed in the Dental Cosmos more than bear out the doctor's claims for the anæsthetic effect of blue rays.

Still another method of producing anæsthesia is that of Prof. Leduc, whose studies with electric currents of low tension have attracted not a little attention. Dr. Louise G. Robinovitch, of New York, one of his assistants, has continued his work and has recently published the results of her investigations. Thus far chiefly animals have been used for experimentation. With 110 interruptions per second, the animal receiving about 1.3 milliamperes, at 5½ volts, complete anæsthesia results. The preliminary contractions seem to be painless. General and special sensibility and consciousness are soon abolished. When fully under the influence of the current, the animal may be picked up by a fold of its skin, turned from side to side, pinched or pricked without provoking any reaction on its part. Hearing and sight are lost. The animal remains limp and senseless so long as the current is kept up, sleep being immediately interrupted by the opening of the circuit. Once awake, the animal shows no untoward symptoms. A large number of these experiments made in Prof. Leduc's laboratory were accompanied by no objectionable manifestations. In some instances the same animal has been subjected to the experiment several times during the same day, without causing the animal any apparent discomfort or fatigue. Prof. Leduc, Prof. Rouxeau, and Dr. Robinovitch subjected one animal to electric sleep during a period of three hours and ten minutes, without having caused it any discomfort. Prof. Leduc has himself performed the experiment on dogs over one hundred times and on rabbits a good many times, obtaining good results in all the cases. He has studied the current in its various phases, and cautions against its application for the purpose in question with a lower frequency of interruptions. A higher frequency is also useless.

Prof. Leduc submitted himself to experiment, and the description he gives of his sensations during this sleep is interesting:

"Although disagreeable, one can readily stand the sensation produced by the excitation of the superficial nerves, as this sensation gradually dies away in the same manner as does the sensation produced by a continuous current; after reaching its maximum, the disagreeable sensation commences to wane, although the potential is still increasing. The face is red, and slight contractions are visible upon it, as well as on the neck and even the forearms; there are also some fibrillary twitchings, and tingling sensations extend to the hands and tips of the fingers as well as to the feet and toes. As regards cerebral inhibition, the center of speech is first to be affected, then the motor centers become completely inhibited. There is impossibility of reaction even to the most painful excitations. At this stage it becomes impossible to communicate with the experimenter. Without being in a condition of complete resolution the limbs present no rigidity. Some groans are emitted, but not on account of any pain; excitation of the laryngeal muscles seem to cause the sound. The pulse remains unaltered, but respiration is somewhat disturbed. The current was gradually increased to 35 volts, and its intensity in the interrupted circuit was 4 milliamperes. When the maximum of the current was turned on I could still hear, as if in a dream, what was being said by those near me. I was conscious of my powerlessness to communicate with my colleagues. I still retained consciousness of contact, pinching and pricking in the forearm, but the sensations were stunted, like those in a limb that is 'asleep.' The most painful impression was that of following the gradual dissociation and successive disappearance of the faculties. This impression was similar to that experienced in a nightmare, in which one feels powerless to cry out for help or to run away when facing great danger."

Prof. Leduc regrets very much that his colleagues did not increase the current sufficiently for complete suppression of sensibility and inhibition of consciousness. The experiment was performed twice, lasting twenty minutes each time. In both instances awakening was spontaneous, with a feeling of well-being.

As the experiment on Prof. Leduc was not complete, it may be of interest to remark that anæsthesia is absolute when a current of sufficient potential is used. Dr. Robinovitch experienced herself complete anæsthesia of the forearm, hand and fingers from a local application on the forearm of this current, 25 volts being used. Anæsthesia was perfect.

THE ADVANTAGES OF PRODUCER GAS FOR LARGE POWER PLANTS.

When the theoretical and practical efficiency of the internal-combustion engine is considered (an efficiency from two to five times greater than that of the average externally fired heat engine) and when we take into account the fact that the smallest gas engines have a thermal efficiency from 20 to 24 per cent, while the largest steam engine, with all the modern refinements known to the art, turns into work only 12 per cent of the heat supplied at the furnace under normal conditions, one wonders why we are not using gas engines in our large power plants. To be sure the first cost of a large producer-gas engine plant is not far from that of a steam plant; for the first cost of a generator, coal-handling apparatus, piping, scrubbers, cleaners, compressor, and engines is about equal to that of boilers, engines, pumps, condensers, chimney piping, and all accessories. On the other hand there are inestimable advantages in favor of the producer-gas engine which should commend it to the notice of the modern engineer. In an excellent paper read by Mr. C. E. Sargent before the Western Society of Engineers these advantages are admirably discussed, and on his paper we base these observations.

Largely because the pressures maintained in gas-engine installations are not as great as those in boiler plants, the depreciation from internal strains and corrosion should be considerably less. Gas engines wear out no more quickly nor are they more exacting in the way of repairs than steam engines. On the other hand, gas producers are long-lived. Mr. Sargent instances one installation of two 200-horse-power producers which have been continuously driven for seven years and in one of which the fire has never been drawn. One can hardly imagine the condition of a boiler after such continuous work.

The waste heat of a producer, amounting to about 70 per cent of the heat supplied, can be used for heating very much in the same way as exhaust steam from the steam engine. It must be remembered, however, that a higher temperature can be maintained with exhaust gases than with exhaust steam. Furthermore, the gas holder of the gas plant provides for the peak of the load, even though the producer is run at a uniform rate. With sufficient capacity of holder the gas producer may be run with a uniform output for every hour out of the twenty-four although the engine load may very widely. Add to this the fact that there are no losses from radiation or leakage as would exist in a boiler plant under pressure, and we have a rather complete picture of the efficiency of a large producer-gas plant.

VALUE OF COMMERCIAL CULTURES FOR LEGUMES.

Great interest was aroused among agriculturists in this country by the newly-developed inoculation process of supplying bacteria for the promotion of the better growth and nitrogen gathering powers of legumes. The investigations undertaken by the Department of Agriculture were apparently crowned with success and much was expected from this method in the betterment of agricultural conditions. From a Bulletin lately issued by the New York Agricultural Experiment Station, at Geneva, N. Y., it appears, however, that these commercial cultures for legumes are exceedingly unreliable. The Station undertook a series of exhaustive tests in consequence of the numerous inquiries which were received as to the quality of the commercial packages of the culture, and the results were anything but favorable; not only so far as the commercial product was concerned, but in the case, as well, of the package received from the government. These extended and careful tests in five different laboratories, using many packages of the cotton prepared at different times, kept under favorable conditions, all comparatively fresh, and used in accordance with the directions, appeared to prove that such packages are worthless for practical inoculation. This must not be ascribed to dishonesty on the part of the company preparing the cotton, for, as mentioned above, the Department package tested gave no better growth than the commercial specimens. The trouble lies in the method itself. The legume inoculating bacteria, dried on cotton and exposed for a limited time to the ordinary changes of temperature and humidity, die or lose vitality so that they do not develop satisfactorily when used as indicated by the directions.

That such cultures rapidly deteriorate on cotton under laboratory conditions was proven by preparing fresh, vigorous cultures, saturating cotton with the bacteria-charged liquid, drying the cotton, and testing portions of it from time to time. In the earlier examinations, within a week or so after drying, a few colonies would develop, but generally the culture plates were found practically sterile at the end of seven days.

These experiments, with their surprising and disappointing results, do not condemn inoculation. They merely show how and why many recent attempts to inoculate legumes have failed. Inoculation as such has not come into question at all; as it cannot be considered inoculation unless living and vigorous bacteria are brought into contact with the plant to be inoculated. The use of the dried cotton cultures has been in most cases only an unsuccessful attempt to inoculate.

The principle of inoculation remains unchanged. There can be no doubt that the introduction of bacteria where lacking and under proper conditions for their growth will benefit legumes.

But it is certain that the commercial packages of cotton as distributed in 1905 are not reliable agencies to secure such inoculation.

SCIENCE NOTES.

In a paper presented to the Académie des Sciences, Messrs. Guntz and Roederer mention their researches upon the preparation and properties of the metal strontium. The properties of this metal are but little known up to the present, and seem to differ according to the authors who treat the question. Therefore, it seemed of interest to take up the study of this body. The authors prepare it by the method which they already used in preparing barium. At first the hydride of strontium is formed, which is free from mercury by the continued action of hydrogen upon a strontium amalgam. When placed in a vacuum produced by the mercury pump and heated to 1,000 deg. C. this body is decomposed and we are able to condense the vapor of strontium on a cooled steel tube without any difficulty. The authors mention some of the properties of the metal which they have observed. Their product contained 99.43 per cent of the pure metal. It is of a silver white color and is crystalline in form, but it tarnishes almost instantly when in contact with the air. It melts at about 800 deg. C. and volatilizes at a higher temperature. Dry carbonic acid gas has no action upon it in the cold. At a red heat this gas is absorbed with formation of a carbide and also of strontia. Ether and benzine have no effect on the metal, but absolute alcohol dissolves it easily and hydrogen is given off. Water is also decomposed by the metal, forming strontia, which is dissolved. In the test which they made to find the heat caused by the oxidation of the metal, they find that this lies between the figures for calcium and barium, as the chemical analogies lead us to suppose.

Henryk Arctowski, a member of the Belgian Antarctic expedition, is planning to go to the South Pole in an automobile. He declares that one may go by ship to the lower end of Ross Sea, at 78 degrees latitude, to the foot of Mount Erebus and Mount Terror, proceeding thence to the point already reached by Scott. This explorer was forced to proceed on foot for five months. He could have continued on his way over the icy plain, but did not have sufficient provisions, and was compelled to retrace his steps. It is now a question, therefore, of finding out how one can accomplish this journey in an automobile, and advance even farther. The distance from Mounts Erebus and Terror to the South Pole is 1,296 kilometers (about 805 miles). Mr. Arctowski believes that he can accomplish this distance in three trips of 432 kilometers (about 268 miles) each. A first automobile will depart loaded with provisions, and will arrive at the first station. A second will be dispatched to restock the first with gasoline, and will return to the point of departure. A third automobile, making two trips, will restock the first automobile at the second station, permitting it to proceed to the actual pole. Returning, one automobile will be abandoned at the pole, and another on the way, it being impossible to do otherwise. They will cover 10 kilometers (6.2 miles) an hour, or 20 at the most, and will be specially constructed, after experimenting on the Alpine glaciers, for instance on the Aletch Glacier in Switzerland. The expedition will depart in August, 1907, for the Antarctic regions.

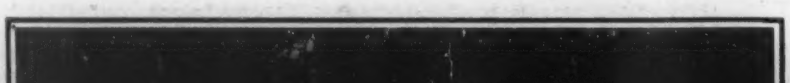
NEW ARMORED WAR AUTOMOBILES.

The new types of armored automobiles equipped with rapid-fire guns, which have been constructed in France and also in Austria, show that a great advance has been made in the way of building a type of car which will answer all the requirements for army use. The maneuvers which have been made with both these cars seem to prove that they are ready for service under all the trying conditions of field work, and that we are much further advanced toward a solution of this important problem. The new Austrian war automobile, of which we give an illustration, was constructed by the Daimler Company at their works at Wiener-Neustadt, near Vienna. This type of car has only been finished recently, and represents the latest ideas in the way of an automobile war car. The experiments and maneuvers of different kinds which were made with the car by the Austrian Etat-Major are said to have been very successful. Especially to be noted is the ease with which the car can be run over uneven ground, across plowed fields and ditches, and the feats which it accomplished in this direction seem to show that it is prepared to meet all the conditions of actual use in the field. By a method of construction which has been kept secret, the car is equipped with four direct-driven wheels, and both the front and rear axles are connected with the motor. The disposition of the front axle and the method of protecting the mechanism will be noticed. The whole car is protected by armor plate of a sufficient thickness, made of special steel. After the box which shields the motor comes a larger protecting house for the driver, which has a hinged door at the side and two lookout holes in front. The top part of the casing has an opening which allows the driver to sit in the position here shown during ordinary times when out of danger, or to lower his seat and thus be completely protected in case of danger. The same maneuver of lowering the seat also operates a device for shortening the steering column to adapt it to the new position. On the rear of the car is mounted the turret which contains the rapid-fire gun. It is of cylindrical form and is topped by a hemispherical dome. The gun itself is carried upon a revolving support, which can also be raised or lowered. At the same time the whole upper part of the turret can be turned about so as to point the gun in any direction.

A 30 H. P. French Armored War Automobile With Hotchkiss Rapid Fire Gun in Turret.

In France, it appears that the progress in the way of constructing armored cars is even further advanced. It is stated on good authority that the well-known Paris firm of Charron, Girardot & Voigt has actually received an order from the Russian government, for as many as twenty armored cars. The experiments with the new cars have been kept a strict secret up to the present, and it is only recently that the matter leaked out. The maneuvers with the new car were made on one of the large military grounds before a delegation of officers from different countries.

The C.-G.-V. firm had already exposed a type of armored car at the 1904 Automobile Show, but this was rather an elementary form. The question seems to have attracted more attention from other countries than from France, and, soon afterward, the Paris constructors were encouraged to take up this line of work, and began designing an armored automobile which should meet all that was required of it. At the time of the official trials it is said that all the principal Etats-Major sent representatives to the maneuvering field. The conditions which had to be met with were not easy to fill, as the car was required to work in the same way as a field battery, that is, to run at a good speed over plowed ground and to clear ditches and all the obstacles of a like nature. The armor plate had to resist the infantry balls, and especially the tires had to be made so that they could not be easily punctured by a ball like the ordinary ones. A view of the new French car is shown herewith. It has a 30-horse-power motor and is of much lighter build than the Austrian car which we have just mentioned, its weight complete being but 6,393 pounds. It is completely armored, with the exception of the tires, and the driver and mechanic are not visible from the outside. In the rear is the turret which contains a rapid-fire gun. All the details of the car were designed and constructed under the supervision of competent military authorities. The turret, for example, was specially designed by M. Guye, commandant d'artillerie, with the idea of suppressing as much as possible vibrations of the gun and of its supporting platform. By a special arrangement the rigidity of the gun and its mounting have been assured, thus making possible accuracy of aim under all circumstances. The turret is revolvable so that the gun can be pointed in any direction. Like all the rest of the armor, the turret is made of a special steel which has sufficient strength to withstand rifle balls without complete penetration at as close a range as 100 feet, and which, when 360 feet away from the gun, is unaffected. In recent experiments with this war car volleys of bullets were discharged at it from the standard French Lebel rifle without damaging it in the least. The armor is about ¼ inch thick—to be exact, 6 millimeters, or 0.236 inch. At 150 feet distance the bullet entered, but did not penetrate, the armor, while at from 325 to 450 feet the armor was simply dented. In the experiments which were made bullets were also shot into the 5-inch Samson tires, the air tubes of which were filled with a special compound intended to make them self-healing. After about a dozen bullets had been sent into the tires at close range the machine was still able to run for some 20 minutes. Two troughs seen attached to the body on an incline over the rear wheels can be used for crossing ditches or climbing out of holes or soft spots. The car will climb an incline of 25 per cent in this manner.



AN AUSTRIAN ARMORED WAR AUTOMOBILE. ALL FOUR WHEELS ARE DRIVERS.

Within the car, behind the driver's seat, is a 31.7-gallon gasoline tank and a 15.8-gallon oil tank. At the extreme back of the car are the seats for the officer and his men. Immediately in front of them is the apparatus for the Hotchkiss rapid-fire gun mounted above in the turret, and which is capable of discharging 600 bullets a minute.

The motor of this machine can be started from within the car, so that it is not necessary for the driver to expose himself to the enemy's fire while attempting this important function.

A word may be said about the experiments which were made not long ago at the maneuvering grounds. First the car was run over all kinds of irregular ground such as would be met with in the field, and it showed a good performance in this regard. Next the maneuver was made against a batallion of infantry. The machine gun, which came from the Hotchkiss firm, fired 1,800 rounds in three minutes, and not a single man would have remained on the ground after such a fire. Then a regiment of dragoons was sent across the plain at full charging speed. Neither the regiment nor the armored car was aware of the other's presence. The car saw the enemy when at a distance of 1,000 feet, and then commenced work with its rapid-fire gun. This would no doubt have annihilated the regiment of dragoons. After the firing was finished, the car retired from the field at full speed.

Firing tests made by a company of infantry upon the armor were quite instructive. The armor plating is of a very light steel, but of more than ordinary resistance, and is about ¼ inch thick. Balls from the Lebel rifle could only penetrate it when fired as close as 60 or 80 feet, and besides most of their force was lost. At 150 feet the balls remained in the plate, while they only made a slight indentation at 300 feet and fell off. Specially to be remarked is the construction of the pneumatic tires. During the trials it was found that the tires could be pierced with ten balls and yet still be able to keep on running for 20 minutes before losing their air. This would give the car sufficient time in which to escape. The automobile carries supplies for a 400-mile run, and 10,000 rounds of ammunition for the rapid-fire gun.

Theory of the Tempering of Steel.

M. Grenet, chief of the laboratories of the Saint Jacques works, in a communication to the Société de l'Industrie Minerale, reviews the theories that have attempted to explain the tempering of steel, one of the most commonly accepted being that it keeps the metal in an unstable state, while normally it is stable cold. He does not think that tempered steels owe their properties to the fact that they preserve the stable state hot, but because they undergo at a comparatively low temperature the conversion that brings them to the stable state cold. He has studied carbon steels, special nickel steels, chrome-nickel steels, and manganese steels.

For nickel steels, as for carbon steels, whenever the conversion takes place at a low temperature, the steel is hard, its microscopic texture is fine, and it remains magnetized after having been submitted to a magnetic charge. This hardness and remaining magnetism may, according to him, be attributed either to the fine texture, due to the separation at low temperature of the elements in a metal not sufficiently malleable for these elements to collect, or to a phenomenon of hammer-hardening due to the change of structure in a metal but slightly malleable and susceptible to hammer-hardening.

In America last year 27,840 automobiles of a total value of $47,768,600 were manufactured. Of these, 22,970 were sold within the year. 1,036 foreign cars were sold for $6,700 each.

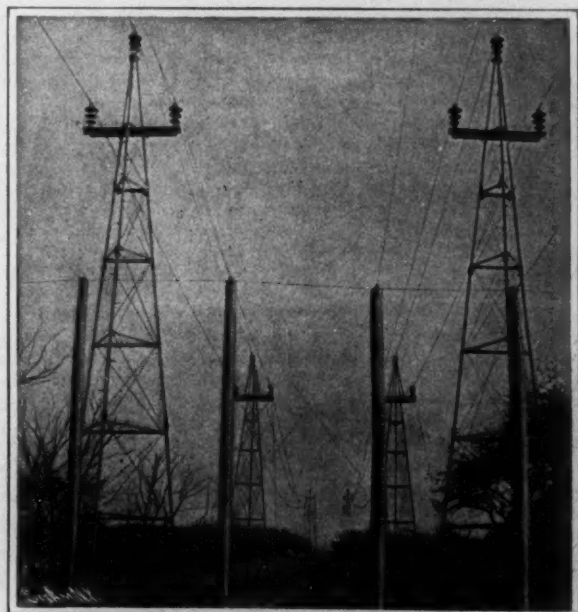
ALUMINIUM TRANSMISSION LINE ACROSS NIAGARA GORGE.

BY ORRIN E. DUNLAP.

Niagara Falls is the center of the aluminium industry in America. Two large plants manufacture aluminium there, one being located on the lands of the Niagara Falls Power Company, and the other on the lands of the Niagara Falls Hydraulic Power and Manufacturing Company at the edge of the high bank. The first-mentioned plant receives its electric power from the power houses that have the big tunnel as their tail-race, while the last-mentioned works receives current from a power house located at the water's edge in the gorge. It was in connection with the power service of this plant that one of the most remarkable fires ever witnessed at Niagara Falls occurred on the night of September 9, 1905. A short circuit occurred on the cables extending up the cliff from the power house. The insulation burned fiercely, and the fire swept up the bank to the gatehouse of the power company in the rear of the aluminium works. Some of the cables were aluminium, and others were copper. Since then a new wire tower has been built over one of the big penstocks that stand out from the cliff in column form, and new aluminium cables strung. Each of the two legs of this new aluminium cable service has eighty-four cables in it, each cable having eighteen wires. Leaving the wire tower at the top of the bank the cables pass through a tile and cement conduit to the pot room of the aluminium works. From this same power house aluminium bars erected on another penstock carry current to the plant of the National Electrolytic Company.

CANTILEVER ARMS THAT HOLD THE ALUMINIUM CABLES OF THE NEW NIAGARA TRANSMISSION LINE.

The new power transmission line between Niagara Falls, Canada side, and Lockport, Rochester, and Syracuse, in the interior of New York State, is being erected with aluminium cables, which are erected on steel towers that have three or four legs. It is on this power line that the first cables for the transmission of power across the Niagara gorge that are not carried on a bridge have been erected. The crossing point is well down the river from the Falls, possibly four miles. Cantilever arms project from the cliff top to carry the cables, which drop down to towers that stand close to the water's edge on either side of the river. From tower top in Canada to tower top in New York State the aluminium cables swing over the rough waters, provision being made for nine cables, or three three-phase transmission systems. On the New York side the cables rest on the towers at the water's edge, passing up to towers on the line of the New York Central road, and then up to the cantilever arms at the top of the bank and to a transformer station there located. Between Niagara Falls and Buffalo thousands of electrical horse-power are transmitted over aluminium cables, so that the new work in the electrical field about Niagara bears testimony to the wonderful popularity of aluminium for power transmission lines. The new Niagara transmission line seems destined to be one of the most notable power transmission lines in the country. At the point of crossing the Niagara River there are nine cables, each composed of nineteen No. 5 wires, and the span across the river is in the neighborhood of 600 feet. Eastward from the New York end six cables of aluminium have been strung on the towers, and the work of carrying the line into the interior of the State is progressing rapidly.



ALUMINIUM CABLES OF THE NEW NIAGARA POWER TRANSMISSION LINE STRUNG ON STEEL TOWERS.

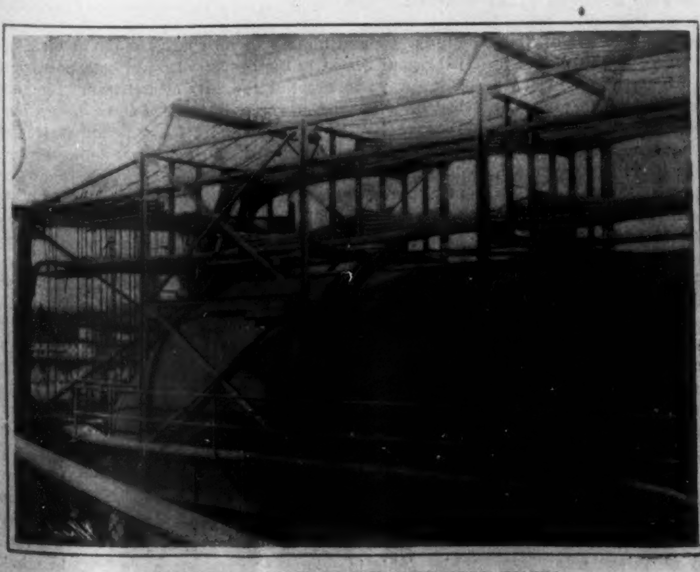
Some Novel Developments in Wireless Telegraphy

Count Georg von Arco, the well-known experimenter in wave telegraphy, recently lectured on the above subject in the great hall of the Berlin Military Academy. After discussing the electrical apparatus used in the generation, transmission, and detection of electrical vibrations, Count Arco emphasized the possibility of measuring the electrical phenomena that attend wireless telegraphy with the same accuracy as those controlling other branches of electricity, the safety in the operation of wireless stations having recently been considerably increased. He next demonstrated, by means of convenient models, the mechanism of wireless transmission from one end of the hall to the other, succeeding for the first time in calling up independently six stations located close to one another without interfering with the operation of any one. The responses of the stations were given by means of signal bells tuned to various sounds. The experience recently made in practical operation agrees with this experiment, the numerous stations so far installed working with perfect regularity and without mutual disturbance.

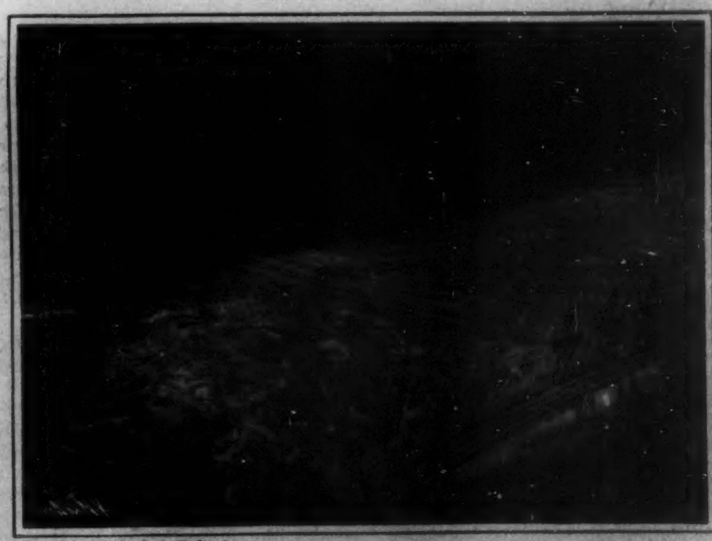
As to the military uses of wireless telegraphy, these have been put to practical tests, both in the Russo-Japanese war and in connection with the Herero uprising in southwest Africa. As regards, on the other hand, the commercial uses of this modern means of communication, the lecturer mentioned some interesting recent applications, e. g., to supplement cables in the case of defects in the latter, or else to constitute a permanent connection between such points as do not lend themselves to a connection by either cables or overhead wires. Several such plants are at present in course of construction; for instance, a connection between Rhodos Island and the Dernah coast station on the north African shore (750 kilometers) as well as another between two localities in the interior of Peru, where the dense vegetation of the forests absolutely precludes the possibility of installing a connection by wire.

The great importance of provisional wireless connections in the case of uprisings, strikes, etc., as for instance those at present occurring in Russia, was next pointed out, such provisional connections by means of transportable stations being now effected in a few hours' time even over great distances.

In riveting with pneumatic hammers, two men and one heater average 500 rivets in 10 hours, whereas by hand 250 rivets is a good day's work for three men and one heater. The cost per rivet, according to the Engineering and Mining Journal, was 1.62 cents by pneumatic hammer, and 3.68 cents by hand. On 93,480 rivets in a shipyard at Chicago the machine cost was 1 cent to 2.5 cents; the hand cost 2.5 cents to 4.5 cents.



ALUMINIUM CABLES IN THE NEW WIRE TOWER.



NEW ALUMINIUM TRANSMISSION LINE ACROSS THE NIAGARA RIVER.

MORNING AND EVENING STARS IN 1906.

BY F. R. HONEY.

The representation of a portion of the solar system illustrating this article is designed to assist the non-professional reader to identify the planets which rise before and set after the sun for any day of the present year.

The orbits of Mercury, Venus, the earth, and Mars are here plotted, and the position of each planet is indicated, in each case, at intervals of eight days. The orbits of Jupiter, Saturn, Uranus, and Neptune fall beyond the limits of the page; but since the motions of the last three are limited to very small angular measurements, and that of Jupiter is not more than about one-twelfth of a revolution, the reader will be able, with the assistance of the drawing, to determine approximately the position in the heavens of each of these planets at any assigned date.

Mercury performs his journey round the sun in very nearly eighty-eight days (more exactly 87 days and 23¼ hours). His position is shown for January 3, and thereafter at intervals of eight days. After one revolution Mercury reaches on April 1 the same position he occupied January 3. The dates are then given for the second revolution, which is completed June 28. The dates for the third and fourth revolutions then follow in order. The third revolution is completed September 24; and the fourth on December 21.

Since Mercury performs his revolutions in a very small fraction of a day less than eighty-eight days, it is evident that, after this exact interval of time, he will have passed a little beyond his position of January 3; and similarly for each of the successive revolutions. After an interval of three hundred and fifty-two days, i. e., after four revolutions and a small fraction, the planet will reach a position which is about ½ deg. in advance of that occupied January 3. For the present purpose the positions are made identical. The drawing is sufficiently accurate, and confusion is avoided. The planet is represented in the position it occupies at four different dates; and similarly for the intermediate dates.

Venus performs her revolution in two hundred and twenty-four days and sixteen and three-quarter hours. Omitting the hours, 224 days brings her almost to the termination of her first revolution. Two hundred and twenty-four is exactly divisible by eight. Her first position is shown for January 3; and at intervals of eight days thereafter. This number of days is selected in order that the reader may readily compare her position with that of Mercury, the earth, or Mars for the same date. Since Venus makes about one and five-eighths of a revolution during the year, it is easy to show her different positions without confusion. She begins her second revolution on August 15, and is represented by the open circle which falls a little behind that of January 3. Thereafter she is represented in a similar manner with the new date attached. The earth and Mars are also shown for January 3; and for every eighth day.

For the intermediate dates the reader will have no difficulty in determining the position of each of the planets in its orbit. Jupiter's position on January 3 is on the line drawn from *S*, which represents the sun, and at a distance from it over five times the distance from the sun to the earth. He will reach the positions indicated on April 1, June 28, September 24, and December 21.

The position of Saturn is shown for January 3, June 28, and December 21. Saturn is at a distance from *S* equal to nine and a half times that of the earth.

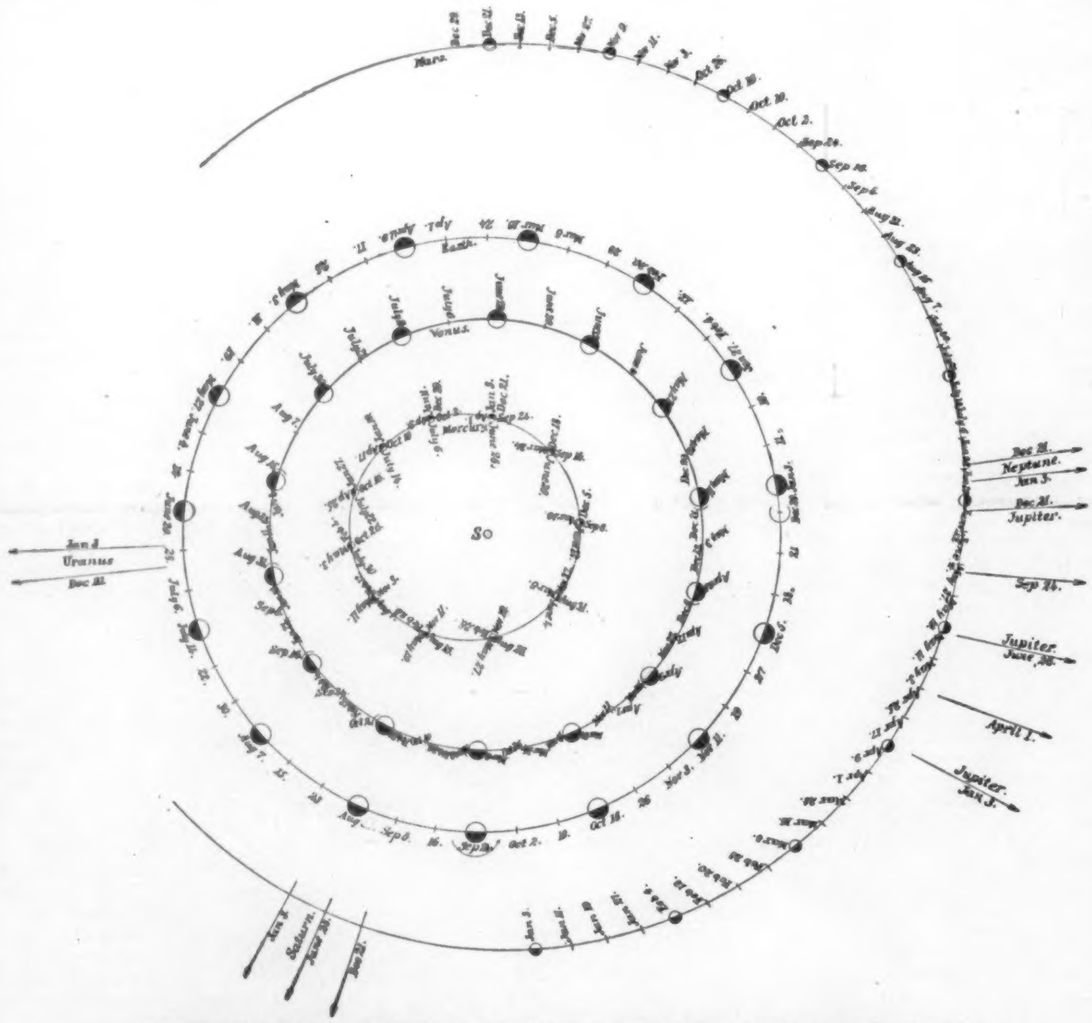
The directions of Uranus and Neptune are indicated for January 3 and December 21. The former is over nineteen times, and the latter thirty times, the distance from the sun to the earth. Since these planets move very slowly, it is unnecessary, for the present purpose, to interpolate intermediate dates.

In order to determine the planets which rise before the sun, the reader must bear in mind that the earth revolves on its axis in the direction represented by the arrow (shown at the date September 24). At sunrise the observer emerges from the shadow area. If the drawing be held in such a position that the earth is between the reader and the sun, and he can read the date without turning his head, he will have a correct exhibit of the relative positions of the sun and planets at that date. In this position, if a planet is on the right of the sun, it evidently rises before him. Should the planet be exactly in line with the earth and sun, as e. g. in the case of Mercury or Venus, if the planet is on the near side, it is in inferior conjunction; if it is on the far side, it is in superior conjunction. If it is at or near conjunction, it will be lost in the sun's rays. At sunset the observer is entering the shadow area. When the drawing is held for a given date in the position above described, if the planet is on the left of the sun, it will set after him. In order to familiarize himself with the use of the plot, the reader is recommended to confine his attention to one planet at a time, and trace its movements relative to the earth and sun throughout the year. For example, if he will revolve the drawing until the earth is between him and the sun for the date January 3, he will read the same date attached to Mercury. Being on the right of the sun, he rises before him. If the drawing be revolved until the date February 20 is reached, Mercury will then be on the far side of the sun, i. e., in superior conjunction. For some time prior to and after this date, the planet will be lost in the sun's rays. After this he will be on the left side of the sun, and will therefore set after him. He will be in conjunction—alternately superior and inferior—six times during the year on the following days: February 20, April 5, June 8, August 12, September 24, and November 30. If the earth were stationary, there would be twice as many conjunctions as revolutions, i. e., eight; but this number is reduced by two on account of the revolutions of the earth around the sun.

Mercury will be seen to good advantage after May 3 before sunrise when near aphelion. He will also be seen advantageously in the early evening after June 28 when approaching aphelion. The last position indicated is December 29, when Mercury will rise before the sun.

Venus rises a short time before the sun on January 3 and thereafter. She will very slowly approach superior conjunction, which she will reach on February 14 She will be seen satisfactorily in the evening about the middle of June. Venus will then approach nearer the earth until November 30, when she will be in inferior conjunction. Her dark side will be presented to the earth, and she will be lost in the sun's rays. She will then rise before the sun until the end of the year.

Mars will be visible in the evening before July 15, when he will reach conjunction; and will then rise before the sun for the remainder of the year.



A MAP WHICH SHOWS THE POSITIONS OF THE MORNING AND EVENING STARS FOR THE YEAR 1906.

Some Wholesome Advice to Lawyers.

New Jersey's lawyers recently paid a deserved tribute to their most distinguished associate, the one who has been longest in practice in the State and who, throughout its boundaries, is recognized as the dean of the profession—Cortlandt Parker, of Newark. In the course of an excellent address Mr. Parker said:

"To my young friends, a word of advice: Stick to the profession—seek to elevate it. Do not seek by it to make money. Doing that makes it a trade—not a profession. Be fair in charges. Help the poor, with advice and with professional aid. If it occurs to you, as it should, to look out for old age, believing that Webster was right when he said that the fate of a lawyer was to work hard, live well, and die poor, use economy, and as you acquire something to lay up, buy in some growing town or city a building, a business one, if you can, even if it involves a mortgage for part; rent will keep down interest and pay taxes and the property one day will enrich you. You will have hard work to get well off by simply saving, and the community will expect you to live comfortably. Do not speculate. Be known in Christian work, and in charity, public and private, according to your means. Study law and history in all spare time, and manifest it by your action in the courts. Do not be a politician. But always vote and do the duty of a citizen. Be member of a party, but independent—a slave to no one. Deserve honors and office. If they come, as if you deserve them they should, do honor to them. If they do not, never mind. There is One who seeth not as man seeth, whose 'well done, good and faithful' is worth all the dignities of all the world."

THE NEW ARMORED CRUISER "TENNESSEE."

The successful completion of the official trials of the new armored cruiser "Tennessee," which took place on the government course on February 12, marks the addition to the United States navy of one more of a class of ships of which the United States navy is very justly proud. The average speed over the whole 80-mile course was 22.15 knots an hour.

The armored cruiser which, in the earlier days of its development, was intended to hold something of a middle position between the battleship and the protected cruiser, has grown so steadily in size and power that the modern type, as represented by the "Tennessee," approximates in fighting efficiency to the battleship. This is evident at once when we bear in mind that the "Tennessee" carries as her main armament

four 40-caliber, 10-inch rifles, whose ability to punish the enemy, even at the more distant ranges, is greater than that of the 12-inch guns mounted on the battleship "Iowa"; for at 5,000 yards the 12-inch projectiles of the Iowa can theoretically penetrate, if they are capped, 9¾ inches of Krupp armor, whereas the 10-inch projectiles of the "Tennessee" can under similar conditions penetrate 11¾ inches. Moreover, these guns are protected by 9 inches of inclined Krupp armor, which is superior to the 14 inches of vertical turret armor carried by the "Iowa." In a comparison of the secondary batteries, the "Tennessee" shows a superiority in total energy; since she carries sixteen 50-caliber 6-inch guns, each with a muzzle energy of 5,838 foot-tons and protected by 5 inches of Krupp armor, as against eight 8-inch guns of 7,500 foot-tons, and six 4-inch guns of about 1,000 foot-tons energy, having about the same protection. The total muzzle energy of a single discharge of all the guns of the "Tennessee" amounts to 202,224 foot-tons, whereas the total muzzle energy of a single discharge of all the "Iowa's" guns amounts to only 169,940 foot-tons. Furthermore, the great superiority of speed possessed by the cruiser (22½ knots as against 17 knots) and the higher velocity and flatter trajectory of her projectiles, would enable her to choose a fighting range and bearing with relation to the battleship, which would put the low velocity guns of the "Iowa" at a disadvantage and yet enable the "Tennessee" to deliver her fire with telling effect.

Our armored cruiser fleet consists of twelve vessels, two of which, the "New York" and "Brooklyn," are now somewhat obsolete, although they are undergoing, we believe, a re-armament and overhauling which will greatly increase their efficiency, at least in respect of the power of the battery. The other ten ships are divided into two classes, in the earlier of which, known as the "California" class, are six ships, namely, the "California," "Colorado," "Maryland," "Pennsylvania," "South Dakota," and "West Virginia." These fine vessels are 502 feet long, 69 feet 6½ inches in beam, and on a 24-foot 1-inch draft they displace 13,680 tons. Each carries four 45-caliber, 8-inch guns in two turrets, protected by 8 inches of Krupp steel, and fourteen 6-inch guns protected by 5 inches of Krupp steel. They have a continuous water-line belt 6 inches in thickness, and their speed is in every case from 22 to 22½ knots an hour.

The "Tennessee" class are larger vessels by about 1,000 tons, the increased displacement being secured by carrying the beam out to 72 feet 10 inches and increasing the draft to 25 feet. The water-line and side armor have been re-arranged and somewhat extended as compared with the "California" class, and the speed is about the same. The most marked improvement, of course, is in the main battery and its protection, the four 8-inch guns protected by 8 inches of armor giving place to four 10-inch guns behind 9 inches of armor, while two more 6-inch guns have been added to the secondary battery.

The 10-inch guns are mounted in two electrically-controlled, balanced, elliptical turrets, each with an arc of fire of 270 deg. Four of the 6-inch guns are mounted in independent casemates on the main deck; one at each corner of the central superstructure. The other twelve 6-inch guns are mounted on the gun deck in broadside, and each gun is isolated by splinter bulkheads of nickel-steel from 1 to 2 inches thick. The whole of the 6-inch battery is protected by five inches of armor. Four of the 6-inch guns can fire dead ahead and four dead astern. Of the twenty-two 3-inch guns, six are carried in sponsons on the gun deck (one of these will be noticed in our engraving forward of the foremost 6-inch gun) six are mounted in broadside on the gun deck, three on each beam in the center of the 6-inch battery, while on the main deck immediately above these and mounted in broadside between the 6-inch gun casemates, are ten 3-inch guns, five on each broadside.

Each ship also carries four of the new 21-inch turbine-driven Whitehead torpedoes, of the type which was fully described and illustrated in the SCIENTIFIC AMERICAN of January 6, 1906.

The hull is protected by a water-line belt of 5 inches of armor, which is worked in vertical strakes amidships, the strakes extending 17 feet 3 inches in height from the protective deck to the gun deck. Throughout the machinery and magazine space this armor is 5 inches in thickness, while forward and abaft it diminishes to 3 inches. This 5-inch armor extends also in the wake of the casemated 6-inch gun entirely up to the main or upper deck. Two-inch nickel steel has been worked in the wake of the 3-inch battery. The barbettes of the 10-inch guns, which are from 4 to 7 inches in thickness, extend from the protective deck to 5 feet above the main deck. The turrets for these guns have a sloping front or port plate 9 inches in thickness, which may be taken as the equivalent of a 12 or 13 inch vertical plate.

Steam is supplied by Babcock & Wilcox boilers to twin vertical triple-expansion engines of 23,000 contract horse-power. The "Tennessee" was constructed by William Cramp & Sons, who also built the armored cruisers "Colorado" and "Pennsylvania," above mentioned, and also our first armored cruisers, the "New York" and "Brooklyn."

RECENTLY DISCOVERED RUINS IN RHODESIA.

BY RANDOLPH I. GEARE.

Spreading over an area between 18 deg. and 22 deg. south latitude and about 27 deg. to 33 deg. east longitude some puzzling ruins have lately been discovered, concerning which very little has so far been published. More than one hundred and twenty separate localities show evidences of the same character of remains, while minor ruins of forts and what were probably guard-houses are scattered for a considerable distance beyond the limits above indicated. Most of the ruins are in or near a region liberally supplied with granite, whose huge bowlders form parts of the walls, which it would seem were erected for defensive purposes. Most of the blocks of granite measure from seven to eleven inches in length, and from 2½ to 5 inches thick, roughly worked into a rectangular shape, while larger ones were often used in building the lower courses. The blocks were carefully laid in the walls, many faced on both sides, the interior being filled up with loose rubble. No cement or mortar was used, but the excellent and solid character of the masonry is proved by the fact that some of the walls, 30 feet high and 16 feet thick at the base, stand as firmly to-day as when they were built—probably as far back as 1,000 to 2,000 years before the Christian era.

The extent of some of the ruins, such as Zimbabwe, Mundie, M'Popoti, Chum, Dhlo-Dhlo, and Khami, would indicate that they were important centers, the first being by far the greatest. The so-called "temple" at Zimbabwe (houses of stone) is perhaps the best example of the architecture employed. It is an elliptical figure of three hundred feet by two hundred and thirty feet. Several ingenious theories have been propounded as to the significance of the curves, of orientation, of the special object of the ornamental work in its walls, and as regards the standard of measurement used, but it is a question how far they can be relied upon. Thus, one explorer states that his measurements of the celebrated cone in the temple differ materially from others that have been made, and on which latter was founded the theory that the unit of measurement was the cubit of 1.717 feet.

It is regarded as strange that none of the buildings is square or rectangular in form. The older ruins are characterized by round ends to the walls and entrances, elaborately ornamented, while those of apparently recent date have square corners and straight walls. Several of the entrances were found to be covered in. At Zimbabwe passages or openings through the walls can be seen, the roof or top being supported by beams or slabs of stone. In the entrances of some of the ruins stout hardwood posts still remain, lying partly in recesses which were left in the wall at the time of their construction, the blocks being laid carefully against the timbers. The theory has been advanced that the entrances to these ruins face the rising or the setting sun, which might indicate some form of sun-worship, but others affirm that these openings point to all parts of the compass, and were evidently placed where best suited to the special locality.

In the older type of ruins the walls generally run in one face from the foundations to the top, while in later ruins the walls are built in two, three, or even four tiers, stepped back, and forming terraces two to ten feet in width, and originally covered with a concrete or cement pavement made of crushed burnt granite.

The most characteristic feature of the buildings is the way in which they were ornamented. Spaces were left in the courses by introducing sloping tiles or thin slabs of stone of different colors, or by laying some courses of a different colored rock. Explorers report that they have discovered several distinct types of ornamental work, which they have named and classified as (1) dentelle, (2) chevron, (3) herring-bone, or double line of sloping blocks, (4) sloping block, (5) check or chess-board pattern, and (6) courses of different colored rocks. The first of these styles of ornamentation—the least common of them all—is formed by placing blocks with an angle facing outward, as is often seen in modern brickwork. The second is a kind of inverted V (the apex uppermost). In the third the V lies sidewise, one following another. In some instances the slabs or tiles of each "herring-bone" are of granite or ironstone, or occasionally a section of granite tiles is followed by one of ironstone. In others the herring-bone figure extends for a long distance, while in others each pattern is separated by one or more full-sized blocks of granite. The "sloping block" is similarly varied. In the check or chess-board style the pattern is formed by leaving out alternate blocks, the dark cavity which remains forming a marked contrast with the gray face of the wall.

At Zimbabwe is seen a special style of ornamental work, consisting of large beams or posts of granite and soapstone fixed into the top of the walls, generally in an inclined position. The objects found in these ruins embrace a large variety, including iron and brass cannon, silver utensils, crockery, beads, glass, etc. These would indicate the presence of the Portuguese at some time. Articles of iron and copper are supposed to represent comparatively recent Kaffir occupation; while worked gold in plates, bangles, beads, tacks, ferrules, etc., are considered to be typical of the ancient builders who, in search of the precious metal, penetrated into what was to them the uttermost part of the world. Such articles as the beads, gold work, roughly carved stone emblems, etc., are claimed by some to establish the antiquity of the ruins beyond doubt on account of the similarity between them and other like objects found in Egypt and Arabia, although it is of course possible that these articles may have been brought from Northern Africa by Arab traders or by migrating tribes in comparatively recent times. This is a problem which further investigation alone can solve.

Mr. Randall McIver, who largely through the assistance of the Rhodes trustees has made extensive explorations in this region, divides these ruin-sites into two groups, the first including the Rhodes estate, the Niekerk ruins, and Umtali; the second embracing Dhlo Dhlo, Nanateli, Khami, and the celebrated Zimbabwe. Dhlo Dhlo is easily accessible from Bulawayo, being only sixteen miles from the railway station of Insiza. Round the citadel there runs a girdle-walk, built of rough, unworked stones, carelessly piled on one another. Viewed as a whole, with the citadel on high ground in the middle, and this rough wall surrounding it, Dhlo Dhlo strongly resembles the eastern fort at Inyanga, whose antiquities have been described as "hill forts," "slave pits," and "water furrows." Some explorers believe that these pit dwellings not unfrequently contained a subterranean passage, but others affirm that they were built up, and not excavated. The builders commenced by raising a massive platform, whose exterior platform was composed of large, unhewn rocks, carefully selected and fitted, while the inside was filled with earth and rubble. On continuing the work down hill, the builders did not content themselves with maintaining the same height of platform all the way, but added extra courses in proportion to the increase of the gradient, so as always to maintain a horizontal surface over the top. On the upper side of the incline the artificial structure might only be a meter high, but on the lower side it was often two or three meters high. So it was possible, by leaving a space within the platform itself on the lower side, to make a pit without excavating at all, and this the ancient builders appear to have continually done. Thus the floor of the circular or elliptical pit is always found on the actual level of the ground outside, though its sides may be as much as eight feet in height.

The cement walls of Dhlo Dhlo are still partially intact, and the circular ones were foundations and floors of huts, but where the circumference of one circle abutted on another, a horseshoe or wedge shaped piece was often inserted to fill the space which otherwise would have been left vacant. Excavations showed these hut-foundations to have been constructed as follows: On the bed-rock was first put a layer of large, rough stones mixed with earth, and a flooring of cement some 40 centimeters thick was laid upon this. Then the cement walls of the round hut were erected upon this floor, and divisional walls of the same material were inserted to divide it into compartments. The walls of the huts bear the clear impress of wooden stakes, against which the cement had been plastered, and stakes were also used to hold together and strengthen the cement of the platform while it was drying. In all these platforms wooden stakes are found within the cement of the floor, generally running clear down to the foundation. There is therefore nothing surprising in the presence of wooden posts standing up above the ground to support the sides of the stone walls at the main entrance.

Some idea of the vast extent of these ruins may be had from the fact that the Niekerk ruins alone cover an area of not less than fifty square miles, and it is said that within their limits it is hardly possible to walk ten yards without stumbling over walls or buildings of rough, undressed stone. The general principle of these ruins is described as embracing nine or ten hills, each of which constitutes a separate unit, complete with its own buildings and divided at the bottom from its neighbor by a boundary wall. Such a boundary is the first in a series of concentric lines which rise one behind the other, at first low and wide apart, then higher and closer together, until the crown of the hill is reached. On one of the lower hills there were counted fifty distinct concentric lines from the valley to the top.

For what purpose could these walls have been built? Mr. McIver disposes of the idea that they were built for purposes of cultivation or irrigation, and concludes that they were intrenchment lines, which leads to the supposition that the inhabitants were subject to sudden attacks from hostile tribes.

In many of these fortified places objects of different kinds were found, including articles of copper, bronze, and iron; also stone implements, quarts and crystal arrow-heads. In one excavation Mr. McIver found the remains of ceremonial feasts, consisting chiefly of bones of antelope. They had been partially burned, and the great logs of the fire were discovered in several cases. There they had been placed, with the ashes from the fire and various small articles and implements, in large earthenware jars, which were found buried in groups of varying number, or sometimes in layers, one on the top of the other.

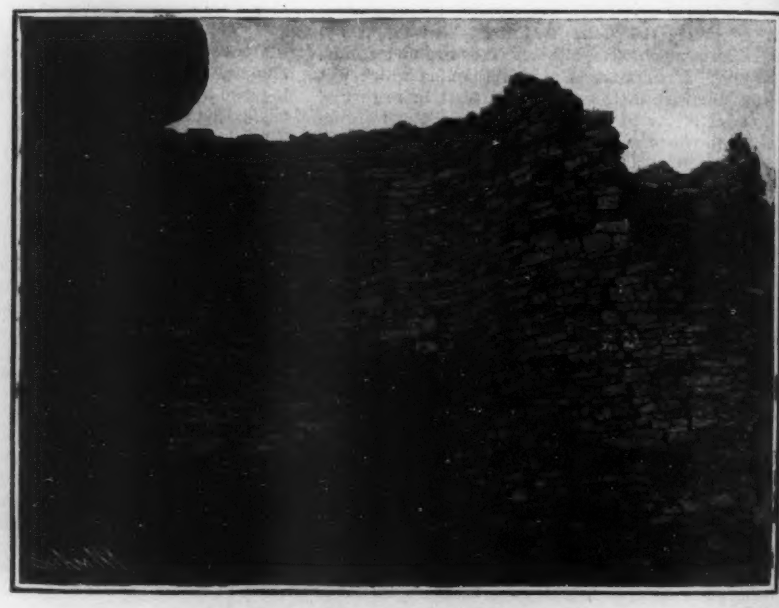
The pottery vessels were all broken and their contents had been poured out; but numerous large fragments were found, which when pieced together, formed a unique collection of well-finished hand-made pottery, decorated with geometrical patterns incised while the clay was wet. In the ash-heaps were numerous small objects, principally iron tools. The stone implements occurred under similar conditions and in the same places as those of iron. Many of these offering-heaps were placed beside or behind little cairns of stones, which suggests some speculation as to the religious ceremonies involved.

Decorated Wall of the Khami Ruins.

Upper Part of Main Entrance Passage of Khami Ruins, Showing Cement-Faced Wall.

Dhlo Dhlo Ruins. A Decorated Wall.

The Monoliths and the Little Towers on the Walls.



Doorway Leading into the Zimbabwe Ruins.

A Passage in the Zimbabwe Ruins.

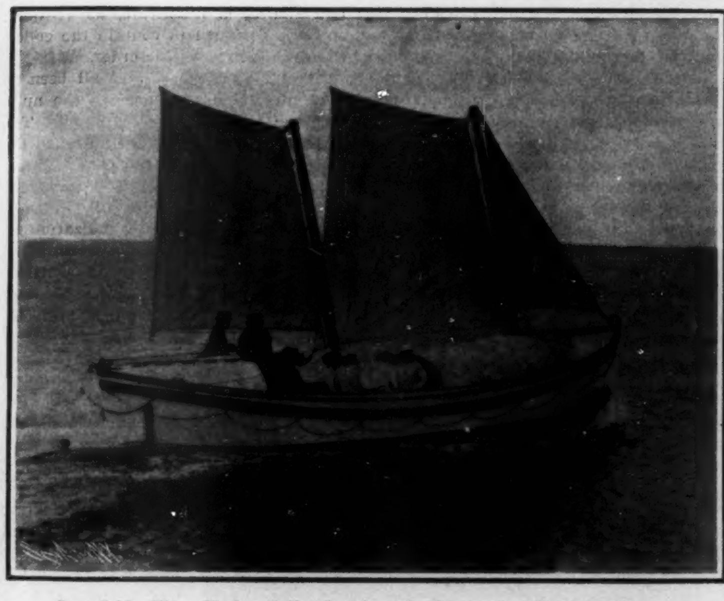
A Soapstone Column, Bearing a Carved Crocodile and Bird.

Cone in the Elliptical Temple of Zimbabwe.

GLIMPSES OF THE RECENTLY DISCOVERED RUINS IN RHODESIA.

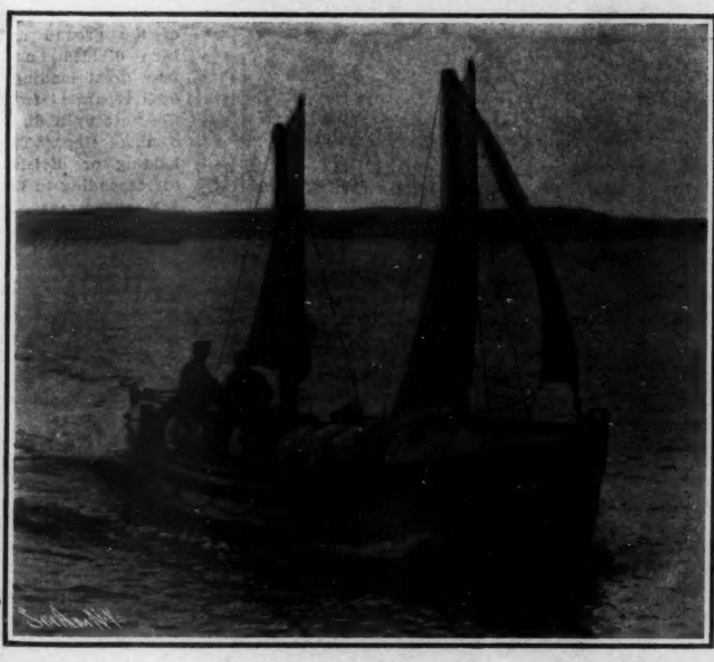
THE GOVERNMENT'S GASOLINE LIFEBOATS.

In the accompanying photographs is illustrated the latest design of the lifeboats constructed for the United States Life-Saving Service. This is of the self-righting, self-bailing, non-sinkable type, of which the government has in service some fifty examples. At the present, those in use are with one or two exceptions handled by means of sails and oars, but in the latest design auxiliary power has been installed in the form of a 20-horse-power Standard gasoline engine, of the four-cylinder, auto-marine type. The advantage of independent motive power of this character is unquestionable. Primarily it relieves the crew of the boat from a great deal of labor of the most exhausting kind, and it furthermore renders the craft independent of the assistance of a tow, formerly frequently necessary when a long distance had to be covered, in reaching a wreck. None of the salient features which are so important in this type of boat has in any way been



Broadside View Under Sail, Showing the Protective Hood in Place.

At Full Speed Under Power.



The Boat Under Sail Alone.

Quarter View of the Boat Hove To.

THE GOVERNMENT'S GASOLINE LIFEBOATS.

interfered with by the addition of the power equipment. This motor lifeboat was built for the government by the Electric Launch Company, of Bayonne, New Jersey, and has fully met the severe requirements and tests necessary for its satisfactory acceptance.

The plans for the boat were furnished by the government, and no previous design has approached the present type in the combination of buoyancy, stability, self-bailing and self-righting ability, passenger accommodation, strength, and speed. Experiments with power lifeboats have been carried on by foreign governments, particularly in England and France, but from the reports obtainable, every indication points to the fact that the boat described herewith is the most successful of its type so far constructed for this class of work.

The dimensions of the boat are: Length over all 34 feet, beam 8 feet, and draft 3 feet. There is a deck at the load water-line, and three cross bulkheads and two longitudinal bulkheads below the deck divide this space into water-tight compartments, which are completely filled with eighty-two copper air tanks, shaped to conform to the spaces they occupy, and removable through hatches in the deck. These air chambers possess sufficient buoyancy to render the boat unsubmergible. In addition there are two air chambers, one at the bow and one at the stern, which are capable alone of supporting the craft, though they are intended principally to aid the boat in righting itself when capsized. Longitudinal air chambers are provided under the side thwarts, and these direct the water coming inboard to the amidships emptying tubes. The combined buoyancy of the air cases is between 11 and 12 tons, and it was necessary to place a load of 44 men of average weight aboard to bring the deck scuppers awash.

The boat automatically frees itself from water taken aboard, through a series of ten six-inch copper tubes, five on each side of the deck. As the latter is above the water-line, the water shipped over the rails, or when the boat is on her beam-ends, will escape through the tubes within a few seconds. These tubes are, of course, provided with automatic valves properly balanced to permit the flow in one direction and to shut off communication from the other. In case of an upset, the boat rights itself almost instantly, and in the tests carried out by the government it was found that it could be held in an inverted position only with considerable difficulty. The self-righting quality is due to the decided gunwale sheer, the six-foot air chambers at each end, and the location of the heaviest weights below the center of gravity. The latter include the gunmetal keel, weighing 1,050 pounds, the centerboard of similar material, weighing 750 pounds, and the copper air cases, which weigh 900 pounds, aggregating a total of 2,700 pounds, thus effecting an exceedingly stable equilibrium, when the boat is right side up, and almost instantly returning it to a normal position after a capsizing. As the danger of boat upsetting is always present in the life-saving service, lateral stiffness is of great importance in the little vessels. In the present design this is excellently obtained by the outside gunmetal keel, the centerboard, the long, flat floor, and the construction and disposition of air chambers, all giving stability in an exceptional degree. The high, raised air chambers at the extremities are invaluable, also, in preventing the overloading of the ends by water or other weight, in giving great resisting power to the submerging of the bow and stern, and in preventing waves from breaking over these.

It is difficult to conceive of a craft which is forced to undergo rougher usage than a lifeboat, and to guard against serious injury from contact with the beach, rocks, floating wreckage, or the vessels' sides, it must be constructed of the finest material, and with the best workmanship. In the present design the keel, keelson, stem and stern posts, are of the best white oak obtainable, while the planking is of clear Honduras mahogany. The latter is in two layers, each ⅜ of an inch thick, the planks laid in diagonally opposite directions at an angle of 45 deg. with the keel, while between the two mahogany layers is a layer of ten-ounce cotton duck, laid in white lead and oil. The planking is copper-riveted through and through. The boat is provided with white oak fenders, six inches wide and two inches thick, extending the length of the hull; two inside bilge keelsons, of 1½-inch yellow pine, forming longitudinal water-tight bulkheads between the end air chambers; and three athwartship bulkheads of the same material, dovetailing into the longitudinal partitions. The deck is very strongly constructed of mahogany.

As means of propulsion the boat is provided with two hollow spruce spars, with sprits, sails, and a jib, ten double-banked 15-foot oars, and the before-men-

tioned 20-horse-power gasoline engine. The rudder, which is worked through a spur-wheel and curved rack, is so arranged that the steering gear can be instantly disconnected from the rudder head, and the rudder hoisted out of the water by means of a fixed purchase, thus allowing the craft to be steered by the oars when entering broken water where steering by rudder would be dangerous.

The motor, which drives an 18-inch propeller at a rate of 400 revolutions per minute, is located in the after air chamber, and a watertight door in the bulkhead gives easy access thereto. The necessary attachments for the engine are protectively secured in casings to the outside of this air chamber bulkhead, where they are always within reach of the man in charge of the motive power. The motor is provided with an ingenious device which instantly stops it in case of an upset. This attachment, which is of very simple construction, consists of two pairs of rings suitably mounted in a vertical position, the lower halves being of metal, while the upper halves are of insulating material. A metal ball can roll freely between these rings, and as the device is included in the ignition circuit of the motor, this ball permits the flow of current as long as it maintains contact between the conducting portions of the rings. However, should the boat keel over to a certain degree the ball rolls onto the non-conducting halves, thus breaking the current, and this is followed by the instant stopping of the engine. The latter can be started again when the boat is righted, as soon as some member of the crew is able to reach the starting crank. The main fuel tank, capable of holding 75 gallons, is in the bottom of the forward air chamber, while a 25-gallon auxiliary tank is placed in the upper part of the same case, fuel being pumped from the lower to the upper tank as required. The feed from the latter to the motor is by gravity through a brass pipe let into the outside keel.

The boat was recently tested in the most thorough manner, and very satisfactorily answered all the requirements as to speed, endurance and carrying capacity. In pursuance of its usual policy in this connection, the government has spared neither expense nor labor to make these lifeboats of the highest utility and efficiency, and it is believed that in this craft the life-saving service possesses a boat as completely equipped for its purpose as it is possible at present to make it, and as thoroughly trustworthy as the danger and gravity of its uses demand.

WIRELESS TELEGRAPHY IN SOUTHWEST AFRICA.

BY OUR BERLIN CORRESPONDENT.

In the beginning of the Herero uprising, the German troops used heliographs for signaling whenever the existing wire connections failed. This service was satisfactory in clear weather, except for the drawback that the communicating stations had to "seek" each other beforehand, a feat possible only in case the approximate position of each is known.

It was accordingly decided to use wireless telegraphy. The Gesellschaft Für Drahtlose Telegraphie, of Berlin, supplied the apparatus, which was mounted by the aerostatic battalion. Three stations were organized, viz., two wagon detachments and one cart detachment, the staff including four commissioned officers, four non-comissioned officers, and twenty-seven men. Gas balloons were used to raise the antennæ.

These stations were first used in practical operation in connection with the attack made against the Hereros near Waterberg. Each of the three detachments was provided with a wireless station, and though the men were not very well trained in the limited time allotted, the troops nevertheless succeeded in maintaining a permanent mutual communication. For transmission up to about 100 kilometers (62 miles) recording telegraphs were used, whereas for greater ranges up to 150 kilometers (93 miles) the Morse signals were received by telephone. The latter course was exclusively adopted later on. While the antennæ were 200 meters in length (656 feet), the men did not always succeed in raising the full length of the wire, the drift of the balloon being mostly too small, owing to the considerable altitude of the ground. This obviously decreased the range of the stations. The dryness of the air and the frequency of atmospheric discharges, as well as of storms and whirlwinds, were other unfavorable factors. Moreover, the dry cells were damaged by the sudden changes in temperature. The projectiles of the enemy obviously were frequently directed against the balloons, which marked the position of the German troops. The balloons, on the other hand, rendered good service to the German detachments, marking as they did the direction of marching.

The whole of the wireless telegraph plant was temporarily placed out of service in October, 1904, in order to allow for the necessary preparations before proceeding to the new theater of war situated southward, some time being occupied in repair work. Three other outfits had arrived in the meantime, which however were not provided with skilled operators.

As regards the relative merits of the various types of station, the wagon stations are said to be more readily transportable than the old cart stations, which owing to their great height are apt to tilt and do not enable the men to ride on them. On traversing some inundated ground the wagon stations readily passed through the water, whereas the cart stations had with considerable difficulty to be transported across a railway bridge.

Wireless telegraphy has thus proven itself a most trustworthy and useful means of communicating information in warfare, though in the present case any disturbances on the part of the enemy were excluded, for the Hereros were not provided with any similar apparatus. It should, however, be remembered that the difficulty arising from atmospheric influences is far greater in that part of Africa than either in Europe or America, while the country is absolutely devoid of any resources for repairing the apparatus.

WIRELESS TELEGRAPHIC BATTALION OF THE GERMAN ARMY. BALLOONS CARRY THE ANTENNÆ TO A SUITABLE HEIGHT.

The Current Supplement.

The opening article of the current SUPPLEMENT, No. 1576, is entitled "Mining for Fossils," and explains the methods which paleontologists employ in obtaining the specimens which they prize so highly. An article of great technological value is that on Valuable Alloys, describing as it does how many metallic compounds are made. Philip M. Wormley's article on "Cement Mortar and Concrete: Their Preparation and Use for Farm Purposes," is continued. "Producer Gas and Gas Producers" is the title of an excellent discussion of a subject of great importance to the modern engineer. Jacques Boyer writes entertainingly on Snail Culture in Bergundy. The report of the Isthmian Canal Commission favoring the high-level canal is also published. This gives a detailed account of the work which will be performed at the Isthmus in excavating one of the greatest ship canals of the world.

One of the largest steel ingots that has ever been made was recently cast at the Manchester foundries of Sir W. G. Armstrong, Whitworth & Co. The ingot weighing 120 tons was cast on the well-known fluid pressure system of this firm. The molten metal, representing 120 tons in weight, was poured from the melting furnaces into a huge ingot mold-box weighing 180 tons. When the run was completed the mold-box was placed in a hydraulic press, the ram of which is 6 feet in diameter, and subjected to a pressure of 6,720 pounds per square inch. The ingot is for the machinery of the new turbine Cunard liner now in course of construction on the Clyde.

THE ROYAL MUSEUM OF NATURAL HISTORY, BRUSSELS.

BY L. RAMAKERS.

The Museum of Natural History of Brussels, one of the most interesting institutions of its kind in Europe, has lately enhanced its collections with new specimens, some of which have excited the admiration of the naturalists of the entire world. Some of these recent additions have completed certain of the collections, that of the iguanodons, for example, and hence the government has been induced to make material alterations in the museum and to provide it with certain special installations, among the latter a gallery set apart exclusively for the splendid iguanodon groups described below. Heretofore few museums have completely carried out, architecturally, the objects for which they were constructed, and the rational distribution of the exhibitions has often been neglected. In the new galleries of the Brussels institution, on the other hand, these very points have been taken into consideration, and the halls constitute, as it were, great glass show cases designed to contain the collections arranged in advance in scientific order.

The arrangement and dimensions have all been so calculated as to be directly proportional to the number and nature of the objects to be exhibited. The fundamental division of the edifice is according to the geological chronology which may be regarded as definitely established. Moreover, since the zoological distinction between the vertebrates and invertebrates is very sharply defined with regard to organization as well as size, and since the methods of exhibiting the two categories of beings must of necessity be entirely different, the national galleries designed to contain the products of the scientific exploration of the Belgian soil comprise two great superposed halls, the lower of which is for the vertebrates and the upper for invertebrates, fossil plants, and minerals.

The vertebrate hall, which has just been opened to the public, is nearly 280 feet in length and 100 feet in width and owing to the slope of the ground has been divided into four great landings, each separated from the next by a flight of three steps. The landing or division corresponding to the present entrance in the reconstructed building is that of the Quaternary Epoch, which also includes the modern period. The others, in the order named, are the Tertiary, the Upper Cretaceous, and the Lower Cretaceous divisions. While it has not been necessary to construct the Jurassic and Primary floors, these have nevertheless been provided for. The accompanying engravings illustrate respectively the hall of vertebrates as a whole, and the splendid group of mounted iguanodons at the rear of the last landing.

Among the important groups, which are all supplemented by charts, drawings, etc., are: On the Quaternary floor, those of the magnificent fauna of the great herbivores and that of the no less important great cave carnivores, as well as the innumerable series of prehistoric industries collected both in the alluviums and in the caves; on the Tertiary floor the great cetaceans of the Upper Tertiary of Antwerp, the sirenidæ of the Oligacene and the reptiles of the Eocene, as well as certain remains of primitive mammifers of very great interest; on the third floor, the Upper Cretacean, are found the great marine saurians of Maestricht and Ciply, the latter from the exploration of the phosphate chalk; on the fourth landing, the Lower Cretacean, the iguanodons of Bernissart and the contemporary animals and plants. Ten iguanodons are mounted upright on a large platform, while fourteen others are placed in a large pit in the positions in which they were discovered. The engraving gives us an idea of the splendid effect of these mountings. The back wall and one of the sides of the hall are provided with a gallery which contains the large collection of the fossil fish of Belgium. Of all these the most remarkable group is unquestionably that of the iguanodons, those prehistoric reptile giants which have so long puzzled paleontologists.

In 1822 Mantelle discovered in the Wealden of Tilgate Forest, England, the isolated fossil teeth of a reptile which he named iguanodon because of the re-

semblance of these teeth to those of the iguana. Until 1874 the iguanodon was known only from certain incomplete remains, and in that year there was exhumed from the Wealden of Bernissart, near Mons, Belgium, a series of specimens which Boulanger described as *Iguanodon bernissartensis*. The animal is of very large size, measuring 30.5 feet from the tip of the tail to the muzzle. When erected upon its hind legs the creature stood over 14 feet above

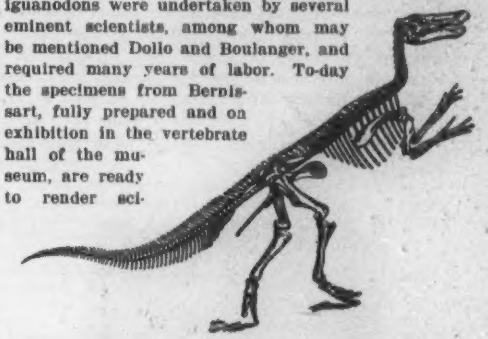
Iguanodon Bernissartensis.

Height, 14 feet 9 inches; length, 31 feet 2 inches. Skeleton shown in walking position.

the ground. According to Dollo, who thoroughly studied this species, the iguanodon probably was aquatic in its habits and existed in the marshes. When it swam slowly it made use of all four limbs and the tail, but if, on the contrary, it desired to move more rapidly in order to escape an enemy or for some other purpose, the forelegs were placed along its sides and the caudal appendage and hind legs alone were used to propel it. It was practically a biped like man and most birds, though not a jumper such as the kangaroo, and when on land walked on the hind legs. The tail was not used as a support, but was allowed to trail.

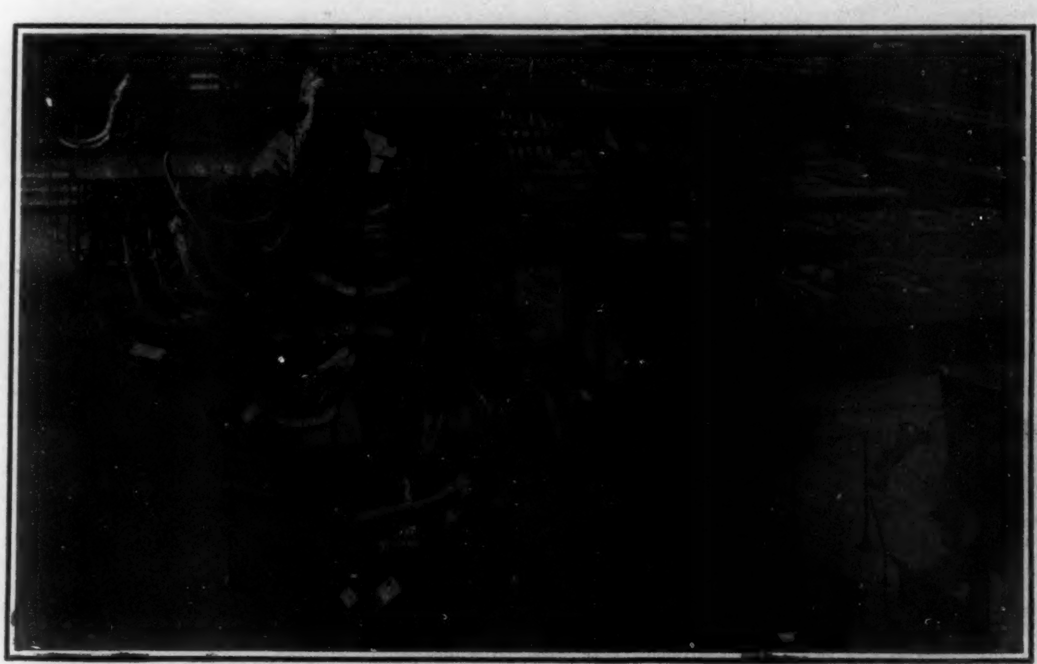
The history of the discovery and excavation of the fossil remains of the iguanodons exhibited at the Brussels Museum is interesting as well as instructive. In 1877 Mr. G. Fagès, superintendent of the Bernissart coal pits, village of Hainaut, between Mons and Journal and near the French frontier, discovered numerous gigantic bones, later recognized as belonging to iguanodons, in a gallery situated at a depth of 1,056 feet and 984 feet beneath the sea level. This gallery was traversed by a wide fault filled chiefly with clay and interrupting the continuity of the strata of the coal formation. The detection of these bones was not easily accomplished, as the concretion was a blackish clay and the laborers nearly traversed the stratum without perceiving the fossils. The clay had already been penetrated a distance of several feet when Mr. Fagès observed the bones on visiting the cutting, and he immediately instituted steps for their removal and preservation. The work of excavation lasted three years, and yielded 29 iguanodons—the majority complete, with a few represented only by isolated groups of bones—5 crocodiles, 5 tortoises, 1 salamander, about 2,000 fishes and nearly 4,000 plants.

The management of the Bernissart coal pits presented these valuable fossils to the Museum of Natural History of Brussels. In order to proceed with the excavation as carefully and methodically as possible, Mr. Depauw, superintendent of the workshops of the Museum, practically adopted the life of a miner, and with his assistants covered the bones with plaster as they were laid bare and then shipped them in this condition to Brussels for study, preparation and preservation. Upon the removal of each piece, a geometrical drawing was made of its position so that this might be studied with precision and could be reproduced in the memoirs that were afterwards to be devoted to this brilliant discovery. The study and restoration of the iguanodons were undertaken by several eminent scientists, among whom may be mentioned Dollo and Boulanger, and required many years of labor. To-day the specimens from Bernissart, fully prepared and on exhibition in the vertebrate hall of the museum, are ready to render science new services thirty years after their discovery.

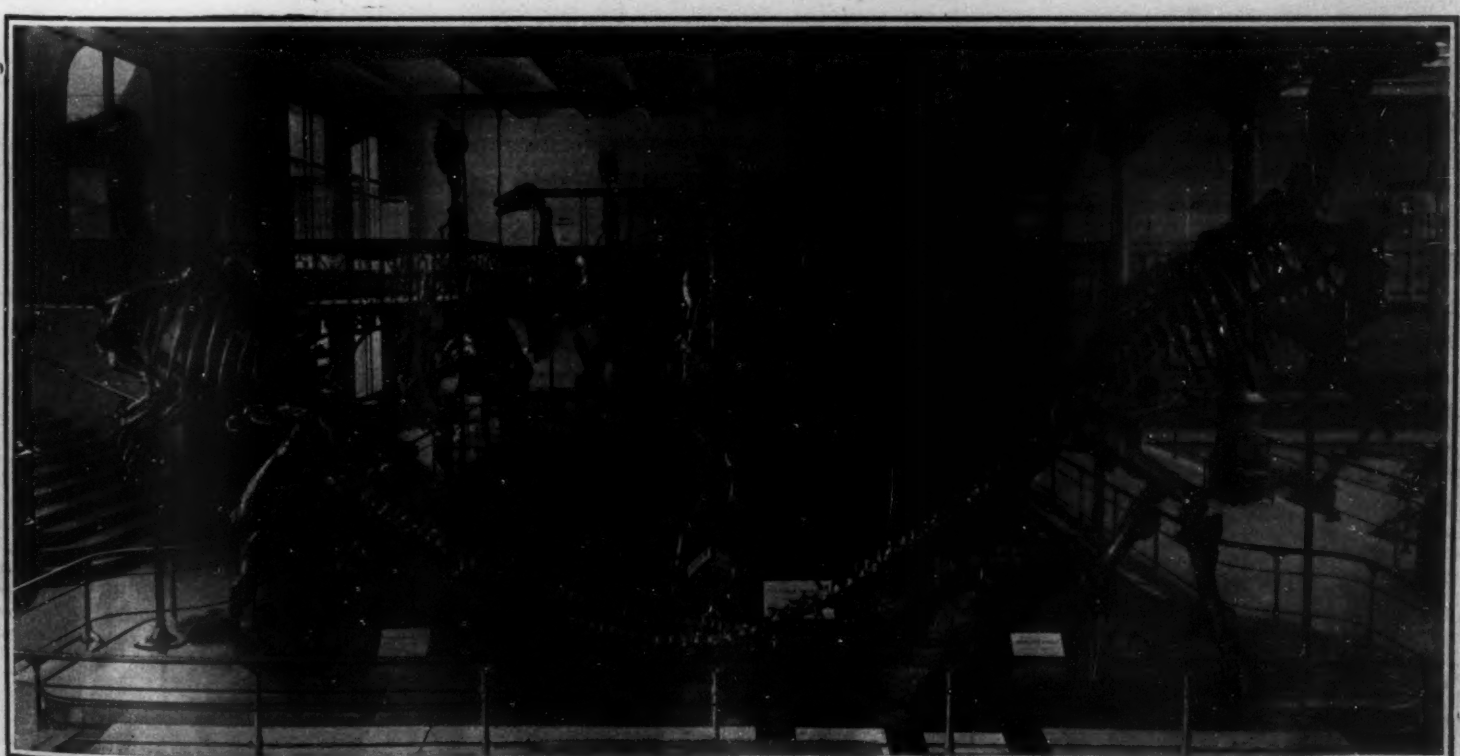


Claosaurus Annectens, Showing Running Position.

In the course of his lecture, before the Automobile Club, Mr. A. G. New referred to the amount of horse-power consumed by windage in driving a car through the air. The manner in which the amount of power absorbed by windage increases as a car gathers speed has been proved by some experiments, the results of which furnished the following statistics: No fewer than 234 horse-power would be needed for windage alone in the case of the 12-horse-power touring car, with which the experiments were made, if it were to travel at 114 miles an hour, while at 71 miles an hour 57 horse-power is absorbed by windage, at 50 miles an hour 20 horse-power, at 32 miles an hour 5.2 horse-power, and at 21½ miles an hour only 1½ horse-power. If such a car were to fall over a precipice, it would only attain a speed of 200 miles an hour, for at that rate of travel the windage would exactly counterbalance the weight of the car.—Motoring Illustrated.



Skeletons of Prehistoric Monsters in the Hall of Vertebrates.

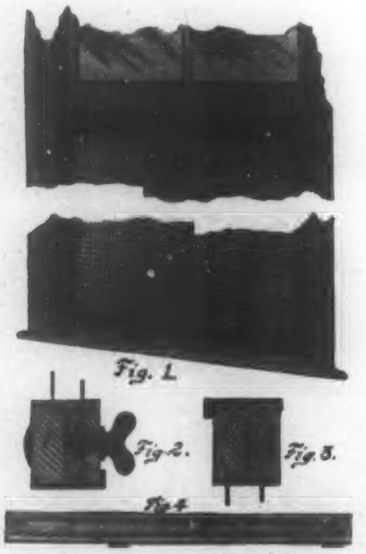


The Iguanodons in the Great Hall of the Brussels Museum

THE ROYAL MUSEUM OF NATURAL HISTORY, BRUSSELS

AN IMPROVED WINDOW SCREEN.

Extensible window screens as commonly made are formed of two overlapping screen sections, adapted to slide one upon the other, so that they can be adjusted to fit windows of different size. A recent invention provides for securing these sections at the desired adjustment by means of thumb nuts threaded onto bolts which are secured to one section and pass through slots in the other. For the purpose of enabling the sections to be extended to their limit without uncovering these slots, sliding plates are concealed in the frame, which are extended when the screen is extended so as to close these slots. The construction is clearly illustrated in the accompanying engraving. Fig. 1 shows the screen as applied to a window frame. A channel plate secured to the upper edge of one of the screen sections overlaps the other section, and affords a sliding connection between the two, while at the same time it closes the gap between the screen and the window sash. The screen sections are held together at the bottom in sliding relation by a pair of clips, as illustrated in Fig. 2. The frame of the rear section is marked 1 in the engraving, while that of the forward section is marked 2. The latter, as best shown in Figs. 2 and 3, is formed both at the top and at the bottom of two pieces, between which there is a recess. In each recess a plate 3 is adapted to slide. This plate is formed with a slot at one end, and a nib or head at the other end. The adjusting bolt is secured to the frame 1, and passes through the slots in the frame 2 and plate 3. In use when the screen is extended, the nib on the plate 3 will engage a shoulder in the recess of frame 2, and thus be extended to cover the slot. When the screen is closed, the end wall of the frame 2, bearing against the end of the plate 3, will push the latter back to its normal position. This arrangement permits of extending the screens to any desired limit and securing them, while closing any opening through which insects might crawl. A patent on this invention has just been granted to Mr. Harry W. Tuthill, 134 Linden Avenue, Middletown, N. Y.



IMPROVED ADJUSTABLE WINDOW SCREEN.

TELESCOPING A CAR OF DYNAMITE.

Thanks to the omnipresent camera, we are enabled to present a photograph of a railroad collision which, because of the attendant circumstances, is of rare interest. According to our correspondent, Mr. R. C. Dodson, of Emporium, Pa., at which town the accident occurred, a switching engine, which was running through the yard, took an open switch and crashed into the first of three carloads of dynamite which were standing on the adjoining track. Our correspondent states that about 100 feet further up the track were four more cars loaded with the same material. As will be seen from the illustration, the tender, which was itself jammed into the cab of the engine, telescoped the forward car, being driven into the latter for fully half of its length. Within the car were 400 fifty-pound boxes of dynamite, or ten tons in all. The boxes were smashed open and the dynamite crushed and broken up. In spite of the terrific impact, however, there was no detonation, a fact which is to be attributed to the fortuitous circumstance that the explosive was "frozen"; that is to say, its temperature was something below 40 to 45 degrees. Had the collision occurred in warmer weather, and had the explosive been some other than a gelatine dynamite, the adjoining town of 3,500 inhabitants would have been swept out of existence. The detonation of from 60 to 70 tons of dynamite in the midst of a town that was built, like this one, in a narrow valley with its buildings ranging up the hillsides, would have been accompanied with destructive effects more easily imagined than described.

The question of the safe carriage of high explosives is one that has been very much in the public eye ever since the recent wreck of a passenger train, due to its collision with a freight train on an adjoining track, one of the cars of which was loaded with dynamite. Among the precautions taken in the carriage of high explosives is to place a distinctive mark upon all cars so loaded. In the present case, as will be noticed in the photograph of the wrecked car, the mark consists of a red star on a white ground.

A SWITCHING ENGINE TELESCOPES A CARLOAD OF DYNAMITE AND ESCAPES DESTRUCTION.

Automobile Notes.

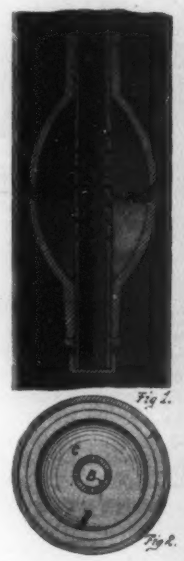
Plans for the Glidden tour this summer have not as yet been perfected. In all probability, however, the tour will extend from Buffalo through Canada to Montreal and thence south to Saratoga or to the White Mountains. There is scarcely a doubt that the tour will be liberally patronized, and that it will be an even greater success than last year.

So great is the increase in commercial vehicles and so wide the field in which they may be used, that there has just been started in this city a new monthly devoted exclusively to this class of automobiles. The first issue of The Commercial Vehicle has descriptions of many of the leading American trucks and some of the foreign ones, as well as useful articles telling what has been and is now being done in this field, and showing how to get the best results. The user of self-propelled vehicles for business purposes will find this new journal very helpful.

The New York Motor Club, which held its first economy contest with successful results last November, will conduct another affair along similar lines next May. A much larger list of entries is expected, and it is hoped that many interesting facts will be learned regarding the economy and endurance of 1906 cars. In this connection it is interesting to note that in an endurance run held recently between Los Angeles and San Diego a Maxwell touring car received a special medal for exceptional excellence. One thousand points were awarded each car before the tour commenced and points were deducted from this maximum for the various break-downs and mishaps encountered. This car traveled 172 miles on 13 gallons of gasoline and 1½ pints of oil, carrying four passengers. This is equivalent to 14 miles per gallon of fuel and 115 miles per pint of lubricant. Its score for reliability at the end of the tour was 1,000 points; but it was then penalized one point for carrying a sign, which was contrary to the rules of the contest. It was the only car in the run, in an entry list of 26 cars comprising 18 different makes, that had a cost per passenger of less than one-half cent per mile. Figuring gasoline at the market price of 20 cents a gallon and oil at 60 cents a gallon, it cost just $2.71 for the entire trip, or 67¾ cents per passenger for 172 miles. This is less than four-tenths of a cent per passenger per mile—to be correct, $0.0039. The same infraction of the rules regarding carrying a sign, cost a Maxwell runabout a gold medal after it had made a perfect score. The cost per passenger per mile for this car was $0.0051, or little over a half a cent per mile.

EJECTOR PUMP FOR DRIVEN WELLS.

A patent has recently been granted to Mr. Charles A. Dryer, of Champaign, Ill., on an improved ejector pump for driven tubular wells. The invention consists in the provision of a novel form of head for receiving and discharging air, steam, or the like under pressure into the well tube, to elevate the water therein. This is clearly illustrated in the accompanying engraving. The well tube is shown at *A*, and the liquid-pressure tube is indicated at *B*. The lower end of the tube *B* is closed by a cap threaded thereon. Mounted on the lower portion of the tube *B* is the head, comprising two cup-shaped members *C* and *C*, arranged with their larger ends adjacent to each other. These ends are spaced apart to form an annular port. It is designed that the width of this port may be regulated and, therefore, the members *C C* are threaded on the tube *B*, so that they can be adjusted toward or from each other. In this adjustment the members are held by jam nuts. It will be noted that the facing walls of the cup-shaped members are inclined upward and outward, so that the fluid pressure acts in an upward direction. The cup-shaped members form a comparatively large air chamber, which receives air from the tube *B* through a number of openings therein. In operation the air, under pressure, is passed down through the tube *B*, and enters the chamber *C*, from which it discharges in the well tube through the annular port, thus creating an upward suction in the pipe, which serves to raise the liquid in the well tube.



EJECTOR PUMP FOR TUBULAR WELLS.

The Fiftieth Anniversary of the Coal-Tar Dye Industry.

The present year will witness the fiftieth anniversary of the foundation of a great branch of chemical industry which, perhaps more than any other discovery in applied chemistry, has reacted upon the science itself to its lasting benefit. Half a century ago the first artificial coloring matter obtained from a coal-tar product was discovered and manufactured by William Henry Perkin under the trade name of "mauve." The subsequent development of the coal-tar color industry has been one continuous series of triumphs, and the colossal scale on which organic compounds of great complexity are now manufactured, often in a state approaching chemical purity, cannot but strike the future historian of scientific industry as one of the most marvelous achievements of applied organic chemistry of the present age. The marvel is enhanced when it is borne in mind that the whole of this industrial development, which has been made possible by the intervention of pure science at every stage, has taken place during the last half-century. The founder of the industry, Dr. Perkin, is happily still in full vigor, and a movement is now being organized to celebrate the jubilee of the discovery and do honor to the discoverer.—Nature.

Rock Salt as a Screen Against Radium Rays.

J. Elster and H. Geitel have found that rock salt is an effective screen against the Becquerel radiation which is distributed all over the earth. It is impervious to gases, and therefore also to radium emanation. In considerable thicknesses it absorbs even the very penetrative γ rays. And lastly, its own radio-activity, is very slight, owing no doubt to the fact that the natural deposits of rock salt were in a liquid condition for some time after the radium compounds had been precipitated together with the calcium. The authors tested the efficacy of rock salt as a screen by mounting a dissipation apparatus in a salt mine near Wolfenbüttel. They found that at the bottom of the mine the rate of dissipation was reduced by 28 per cent. The residual radio-activity must be ascribed to thorium compounds, which are not so easily precipitated as are radium compounds.—Elster and Geitel, Physikalische Zeitschrift.

RECENTLY PATENTED INVENTIONS.

Of Interest to Farmers.

MACHINE FOR DIGGING BEETS.—A. H. KRAMER, Monte Vista, Col. The purpose in this case is to provide a machine embodying devices for automatically lifting beets from the ground in a manner which will not materially injure them, a conveyer which receives the uprooted beets, and an elevator device which receives the beets from the conveyer and delivers them to any desired receptacle. It is a division of the application for a device for digging and topping beets for which Letters Patent were recently granted to Mr. Kramer.

FERTILIZER-DISTRIBUTER.—J. Q. GOURDIN, Pineville, S. C. By this invention Mr. Gourdin seeks especially to provide a distributer for use with cotton-seed, and in the use of which the seed, which is largely used as a fertilizer in southern sections, may be crushed. Corrugated rollers operate to crush the seeds, and also operate as a force-feed delivering material positively from the machine as it proceeds when the different parts are in feeding position.

CORN CUTTER AND SHOCKER.—E. BERRY and H. S. BERRY, Hebron, Ohio. This machine is of light draft, easily operated and not liable to get out of order. By cutting only one row of corn and elevating the corn over the bull-wheel the side draft is minimized. The shock being already tied when the cradle is tilted, it will remain in an upright position, and the waste of broken blades from frequent handling is avoided. The provision of an extension on the track permits entire disengagement of a shock from the machine before it is up-ended, thus allowing a minimum height of elevator.

HARROW.—W. H. BOND, Newcastle, Ind. One purpose of this invention is the provision of a double revolving harrow which also acts as a leveler so constructed that the ground over which it passes is harrowed both ways at one operation, and further, to provide the harrow with a spring-controlled colter at the rear.

CLASP.—I. STEINBERG, Nashville, Tenn. The construction in this instance provides a secure fastening impossible to unloose except by depressing a spring, and since the spring is inclosed within the casing it is impossible to depress the spring except by the use of the button. Properly manipulated, the clasp is easily unfastened. It is especially applicable for securing jewelry—such as bracelets, necklaces, girdles, etc.—since the liability of loss by accidental unfastening is reduced to a minimum.

Of General Interest.

FRANGIBLE CAP FOR THE CLOSURE OF BOTTLES.—S. M. STEVENS, Tampa, Fla. The design of this inventor is to prevent the filling of bottles a second time with liquor that may be inferior in quality. He provides a frangible cap as a cover for the top of a filled bottle, which adapts the cap for very effective service as a fixed cover for the cork of the bottle and which must be broken to afford access to the latter for its removal, thus preventing the refilling of the bottle as an original liquid-package.

SELF-ADJUSTING BELT FOR SUPPORTING CATAMENIAL BANDAGES. — EUGÉNIE SCHICK, Fly Mountain, N. Y. This supporting-belt is adapted to conform with motions and different positions of the person wearing it, thus conducing to comfort and avoiding binding, constriction, or chafing while in use. This supporting-belt for a sanitary bandage is formed entirely of fibrous fabric, which is devoid of buckles or connections that are uncomfortable, is washable, very light, and to or from which an ordinary napkin may be readily attached or detached as may be required.

DEVICE FOR DRESSING STONE. — H. HUGHES and R. HUGHES, Mount Vernon, N. Y. In dressing the surfaces of stones for building and other purposes to form channels or grooves therein it has been usual in many instances to employ a dressing-tool of rectangular form provided at opposite edges of one of its faces with corrugations or ribs, the edges being beveled to form teeth or cutting portions, the latter provided with four bolt-holes and secured to a holder therefor in the dressing machine by means of bolts inserted in said holes and clamping devices. It is possible to use but a limited proportion of this character of tool, and the principal object is to overcome the above disadvantage.

PROCESS OF TREATING METALS.—H. H. GOODSELL, Indiana Harbor, Ind. The present invention relates to methods for treating metals, and more particularly to a process for treating sheet iron and steel, so as to convert thereupon a surface adapted to resist the tendency to rust and also adapted to improve the appearance and working qualities of the metallic sheets. In this process the inventor treats metallic sheets somewhat differently than in his former patent, one principal difference being the beginning work upon the sheet at comparatively low temperature and finishing at temperature comparatively high.

ADVERTISING DEVICE.—P. COUPETTE, Cologne, Germany. Though applicable to different purposes, this invention has reference more especially to devices employed in cars and similar vehicles for successively indicating the several stations lying along the route traversed by the car. In the upper part of a casing a roller is mounted, suspended from which at intervals are a plurality of advertising-sheets, which are caused to be successively wound upon the roller and which also successively drop to vertical position. The inventor employs special means to effect intermittent movements of the roller, as well as special stop devices therefor.

BOTTLE-CLOSURE.—A. CELENZA and D. CELENZA, New York, N. Y. This invention pertains particularly to improvements in devices for drawing corks from bottles, the object being to provide a cork-drawing device designed to be used in lieu of a corkscrew and connected directly to the cork and by means of which the cork may be readily drawn out without injury or breaking of the cork, thus making it possible to use the cork several times.

LOG-DERRICK.—H. COMBS, Upson, Wis. The invention is in the nature of an improvement in log-derricks, sometimes called "log-jammers," the same being in the form of a portable derrick used in woods for handling and loading heavy logs. The derrick folds down flat and may be dragged from place to place like a sled and be quickly erected for use at any point and substantially braced to stand the lifting strain.

CHAIN SLING AND TRIP.—W. E. GAGE, Hohen Solms, La. The intention of this inventor is to provide a device for handling bulky and heavy masses of cane and other like material in its transfer from carts to cars or from barges to carts or cars or for storing purposes. It permits the load to be drawn closely together and holds it firmly and yet is easily released when desired.

REFRIGERATING MEANS.—J. BECK, Ashland, Wis. The principal object contemplated in this case is the production of an economic means of refrigeration in which ice is employed and which are adapted for application to cooling of buildings, cars, butchers' refrigerators, and those of private houses, and of any other kind in which the degree of cold produced by melting ice is sufficient for the purposes. Economy of operation is secured by maintaining circulation of air beneath instead of on all sides of the ice, as is ordinarily the custom.

OAR-LOCK. — A. ANDERSON, Mason, Wis. One purpose of the improvement is to provide a simple and effective oar-lock adapted for permanent attachment to an oar and yet have removable connection with the gunwale, the oar-lock being so constructed as to enable the oarsman to have full control over the oar and to operate it with less fatigue than ordinary.

FOLDING PHONOGRAPHIC HORN. — M. L. MUNSON, New York, N. Y. The invention relates to horns such as are attached to phonographs or similar instruments for intensifying sound and throwing it in a desired direction. The object is to produce a horn of simple construction which may be folded so as to occupy a small space, enabling it to be conveniently carried or packed for transportation.

HORSE-COLLAR FASTENER.—J. C. CLAUSEN, Wausa, Neb. The invention has reference to improvements in horse-collar fasteners of that class designed to lock the two sides of a collar and to permit the ready separation thereof to facilitate the placing and removal of the collar when desired, and has for its object to provide a simple, cheap and efficient device.

SHOE-LACE.—W. H. CLING, Charleston, S. C. The invention comprises a flexible lace of ordinary construction, and the flexible wire which is attached thereto, the ends of the wire being twisted tightly about the lace proper and the body of the wire being extended along such lace between such points of attachment, and the ends of the lace proper being left free.

FLASH-LIGHT DEVICE. — T. AZUMA, Kanda, Tokyo, Japan. The invention pertains to improvements in flash-light devices for use in photography, the object being to provide a flash-light lamp or device that will be simple in construction and so arranged that the flash will be directed upwardly and laterally in a thin sheet.

CAMERA ATTACHMENT. — M. I. LORYEA, Spokane, Wash. Mr. Loryea's object is to provide a camera with a convenient means by which plates exposed in the camera may be numbered or otherwise marked for identification. He attains this end by a peculiar arrangement of transparent tape or tapes having numbers thereon, which numbers are photographed onto the plates at the same time that the plates are exposed before the object to be photographed. By partly shifting a "shutter-tape" a number may be partly covered, and in this way additional combinations of numbers may be made so that by providing two tapes with two sets of numbers thereon a great number of combinations may be made.

INSTRUMENT FOR REMOVING RIBS.—A. W. FRENTZEN and J. SCHOEMAKER, 47 Raperburg, Leiden, Netherlands. The first available piece of the rib to be cut through is laid bare, so that at this place the pleura is removed from the rib. The instrument is held in such a way that it is turned with its hook toward the pleura, the operator then pushing the hook on the piece of rib laid bare and then pressing the instrument along the rib, effecting it by jerks, and so loosening the pleura more and more from the rib until advancing the instrument to the place at which separation of rib is to take place. By pressing the instrument's two shanks together a knife passes over the same and cutting through the rib is effected.

Household Utilities.

WARDROBE.—P. DOWD, New York, N. Y. One purpose of the invention is to provide a wardrobe especially adapted for use in schools, assembly halls and rooms, or rooms adapted for large gatherings, but which can be used with equally good results in private dwellings, the wardrobe being so constructed that it will accommodate a maximum quantity of clothing and so that each individual can have a separate division.

Machines and Mechanical Devices.

BOOT AND SHOE CLEANING AND POLISHING MACHINE.—B. F. LLOYD, Cherry Gardens, South Australia. A reciprocating frame carries brushes arranged, preferably, in three pairs of special form and attachment and is connected to a crank disk or handle, whereby it is reciprocated. The first pair of brushes removes the dirt, the second applies the blacking, the third polishes the boots. The movable slide is fitted with lasts of spring-steel wire, upon which the boots are fitted, and so passed between the several pairs of brushes. Blacking-supply is preferably mounted upon the reciprocating frame.

AXLE-BEARING.—J. K. GOURDIN, Pineville, S. C.—The spindle-skein receives the wear of the wheel and by its end flange receives the end thrust of the wheel-hub, relieving the spindle and the shoulder at the inner end thereof of all wear. The hub-skein having the openings for the lubricant aids in lubricating the bearing and by turning with the wheel takes up all wear upon the hub-bearing, so that when skeins are worn they may be readily removed and a new bearing provided by supplying new skeins. A washer with a lug holds the skein to the boxing so that the hub-skein with the wheel.

MOLDING-MACHINE.—P. G. LEMING, F. EIKLOR, and C. W. GRANT, Urbana, Ill. The machine is especially adapted for the manufacture of hollow cement building-blocks, although it is capable of general use for molding plastic materials. The invention comprises a hand-operated machine provided with an automatic core-extractor and means whereby the molded article can be readily transferred from molding position and released from the mold in a rapid and efficient manner.

CANCELING-MACHINE.—W. G. MAYNARD, Rondout, N. Y. This machine cancels stamps affixed to mail matter. Letters are placed in the delivery-holder with stamps all turned in one direction and situated at the lower edges. Upon rotating the main driving-gear, feed-wheels successively advance the letters beyond the guide-rolls until seized by feed-rolls. These move them along against a gate, which is then withdrawn and the controlling-roll being pressed out causes the mechanism to bring up the impression-roll as each stamp passes over it, where it receives imprint of die, and places the name of canceling-office and date upon the envelop. The second pair of feed-rolls brings letters under influence of revoluble arms, which introduces them into the receiving-holder, from which they are removed.

FEEDER.—W. G. MAYNARD, Rondout, N. Y. In the present patent the invention has reference to feeders, and more particularly to those adapted for use in connection with canceling-machines. Its principal objects are the provision of means for securing a regular and unitary delivery of the objects operated upon.

SMELTING AND REFINING PROCESS.—E. C. POLLARD, Seattle, Wash. The prime object of the invention is to bring about not only the smelting of the ores, but the refining or conversion of the matte to produce the finished metallic product by a continuous operation, in which all of the steps are independent and performed in immediate succession, thus making a single concrete process do the work heretofore generally performed by separate processes, and thereby saving in numerous respects.

SMELTING AND REFINING APPARATUS.—E. C. POLLARD, Seattle, Wash. This apparatus keeps up a continuous smelting and refining operation. Matte and slag produced in the cupola-furnace flows through the passage therefrom into the settler. From this settler lighter and less valuable portions of slag pass off to the dump, while matte and more valuable portions of slag pass by gravity into the converter. Here matte is subjected to a Bessemerizing blast, and slag forced back into the furnace bowl, thus bathing matte and other substances therein, and returning to the settler. The refined metal passes from the base of converter out into the receiver and drawn therefrom as it accumulates.

ODOMETER.—B. VOLKMAR, New York, N. Y. A series of registering-disks and a series of recording-disks are mounted upon the same carrying-shafts, and recording-disks are so arranged that they show the aggregate amount of miles traveled during a number of trips—for example, the registering-disks are adapted to show miles made during each trip, and the arrangement of the latter disks is such that they may be quickly and conveniently turned back to zero at any time by turning the carrying-shaft and without changing position of the recording-disks.

Prime Movers and Their Accessories.

ROTARY ENGINE.—H. BURLICH, New York, N. Y. In the present invention the object of the improvement is the provision of a new rotary engine arranged to permit convenient and quick reversing whenever desired and to allow of cutting off the motive agent at any desired point to utilize the motive agent expansively and to the fullest advantage.

AIR-ADMISSION DEVICE FOR FIRE-BOXES.—C. B. CLARK, New York, N. Y. The device is adapted for any style or form of furnace. It heats the air going under the hood and through the flue to allow a larger amount of hot air than cold in the furnace, and distributes the air in the furnace in larger quantities so as to form a more complete combustion of gases and make a more intense heat. The fire in front of the flue consumes the smoke before it passes out of the furnace, so that it does not receive as heavy a draft. Thus a double fuel is provided as both the gases and smoke are burned.

Pertaining to Vehicles.

PROTECTING DEVICE FOR PNEUMATIC TIRES.—E. LAPISSE, Elbeuf, 9 Rue de la Barrière, Seine-Inférieur, France. The object in this case is to so construct the device that it shall comprise on its edges, provided for that purpose with flat flanges, hooking devices of peculiar shape designed to secure the same to the cover of the pneumatic tire, while avoiding the wear and tear to which the protecting devices now in use are subjected on account of the continuous strain to which the usual hooking and fixing devices give rise.

BRAKE FOR BICYCLES.—G. A. LOVE, Cokato, Minn. The axle of the rear wheel is provided with a rotatable member for operating an expansible device to frictionally engage the inner surface of the hub of the wheel by which to accomplish the forward movement of the latter in ordinary operation of the machine, said device being provided with means for automatically disengaging the same from the hub on temporarily checking the driving power of the wheel for coasting. In connection with the friction device is employed means in effecting certain operations of the brake, and in combination with these means, are means to permit machine to be driven forwardly.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 7947.—Wanted, address of makers of engravers' lathes, copper wheels, etc.

For mining engines. J. S. Mundy, Newark, N. J.

Inquiry No. 7948.—Wanted, makers of kinetophonographs.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 7949.—Wanted, makers of gasoline traction engines which are practicable for plowing and threshing purposes.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 7950.—Wanted, a fume or odor collector or ventilator for a cooking stove.

I sell patents. To buy, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

Inquiry No. 7951.—Wanted, the addresses of mills where brown cotton, blue denims, and Alabama plaids and stripes are made.

Well gotten up typewritten letters will increase your business. $2 per 1,000.

Typewritten Letter Co., St. Louis.

Inquiry No. 7952.—Wanted, the name and address of the manufacturer of the musical novelty called the "Flutophone."

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company. Foot of East 138th Street, New York.

Inquiry No. 7953.—Wanted, modern machinery for crushing and bolting garnet and white flint, such as used in making sand paper and sand cloth.

FOR SALE.—Self-swinging gate, great improvement. Sell or lease on royalty. Patented November 21, 1905. Claude Siebring, George, Iowa.

Inquiry No. 7954.—For makers of small steam turbine blowers for forges and furnaces.

I have for sale the U. S. and all foreign rights of new patent improvements in Water Tube Types of Boilers. Great economiser. J. M. Colman, Everett, Wash.

Inquiry No. 7955.—For manufacturers of or dealers in self-threading needles for hand and machine sewing.

WANTED.—Practical storage battery man to join me in making small storage batteries. Must have some capital. I have building and power. Capital, Box 773, New York.

Inquiry No. 7956.—Wanted, manufacturers of air riveting machinery, and also cranes to lift about one ton.

FOR SALE.—Patent office reports 1790 to 1836, 1846 to 1871 complete, except 1850-51 agriculture only. Fifty-six volumes. Also first volumes of Official Gazette. Address offers T. M., Box 773, New York.

Inquiry No. 7957.—Wanted, a potato-peeling machine.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery tools, and wood fiber products. Quadriga Manufacturing Company, 18 South Canal St., Chicago.

WANTED.—An experienced mechanical draughtsman. Must be competent to design machinery from sketches, must be able to accurately estimate weights and costs. No inexperienced correspondence school graduates need apply. Address or apply to Broomell, Schmidt & Steacy Co., York, Pa.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(9903) J. L. A. asks: I would like to get some information looking to the making of a good dry battery for gas engine ignition, one that is up to date. I have an instruction book on the subject, but there are two or three things I would like to know before making any of the cells. Is the ordinary sheet zinc, as used for lining baths and such uses, suitable for the making of dry cells, and can it be used at once as bought, or should it be put through any process, such as amalgamating it? May gas carbon, as procured at the gas works, be used for the powdered carbon, and to what degree should it be powdered, and should the finer particles be sifted out? May old battery carbons be used? To what degree of fineness should the black manganese be brought, and should this be free of very fine portions? Is this latter likely to be impure, and how can one test it for purity? Should the blotting paper be of a very porous nature, or just the ordinary white blotting paper? Would there be any advantage in using a felt for the absorbent material? Will the ordinary gas carbon be the best material for the carbon element, and what proportion in diameter should it bear to the diameter of the cell? I understand a round carbon is the best. Is this so? A. The ordinary sheet zinc is suitable for the cases of dry cells, made up as it comes. We should wash out the inside with dilute hydrochloric acid before packing in the materials, since this will bring a pure zinc surface to contact with the active materials of the cell. It cannot be amalgamated, since the mercury will cut its way through sheet zinc in a very few minutes, and it will crumble to pieces. It matters little whether the gas carbon comes from gas works as coke, or from old battery plates or electric light carbons pounded to pieces; any of these are all right. If it had been essential to use a particular form, your instructions in the book would have stated the form to be used. Use the manganese dioxide as it comes from the dealer. It may be a powder, not necessary to sift it. If you buy chemically pure manganese dioxide, the cost is greatly increased. The ordinary commercial article will serve all purposes. Only the oxygen of the dioxide is used in the battery. Any porous material will answer to be saturated with the solution. If only thin blotters are to be had, take two layers of the paper. It is not necessary to use felt or paper. You can make a dry cell in almost any way in which active material comes into contact with zinc, and get your result, although one arrangement is by no means as good as another may be. A cylindrical carbon is to be preferred, since it has a larger surface, and all its exterior surface is near the zinc on the outside, so that the internal resistance is much lower than if a flat plate of carbon is used. We have published in our SUPPLEMENT, Nos. 1383 and 1387, full and very plain instructions as to making dry cells. We send these for ten cents each, and you would do well to have them to refer to or to follow, since they give plans and dimensions of all parts. A "semi-dry" cell is one from which if upset liquid will not run out. Some absorbent material is used—even sawdust has been used—to retain the liquid.

(9904) H. E. B. says: What will remove tarnish from gold? What chemical fumes will tarnish gold? The bows of my gold glasses have become tarnished, and the only thing it might have come from that I think of is from some of the fumes in the chemical laboratory. Is the percentage of injuries from railroad accidents in the United States a quarter or less proportionately to those in England? In starting a shunt motor, why should there be a resistance in series with the armature? A. Silver polish will probably remove the tarnish from the gold rims of your spectacles. If these are plated, it may not be the gold which has been tarnished. Show them to your professor, and he can doubtless tell you the cause of the discoloration. Many more people are injured in railway accidents in America than in England. A resistance is put in series with the armature of a shunt-wound motor upon starting it, because the resistance of the armature is so low that an undue amount of current would rush through the armature were the current turned upon it while it is at rest. As it picks up speed the counter E. M. F. cuts down the current in the armature. Hence the resistance is turned off.

(9905) W. J. S. asks: 1. How can I construct a coherer that will receive impulses from a transmitter situated about fifteen hundred miles distant? I would also like to know at what altitude I am to place the aerial conductor in order to get the best service from the above-mentioned coherer. A. The coherer consists of a small glass tube filled with metal filings. It may or may not be sealed, but if sealed by fusing the wires in at the ends, it is usually exhausted to a high vacuum so as to prolong the life of the filings. The details of making a coherer, which cannot well be given in a letter, may be found in an article in SUPPLEMENT, No. 1361, which we send for 10 cents. 2. Is it possible to "step up" a very low voltage to one of infinity in the following manner of transformation? Place a small cell of battery in series with the primary coil of the Ruhmkorff type, connect the secondary terminal of this coil with the primary of an induction coil of greater capacity, and continue this mode of procedure until a sufficient number of coils are used to get the required voltage. Would this method, if practicable, be better than using a strong battery and one high-capacity induction coil? A. It is not possible to use a small cell on a small coil and have the secondary of this act upon the primary of a larger coil, and so on until an "infinite voltage" is reached. You get out of the second coil no more than the small cell can put into the first, less losses, and if this is stepped up the amperes become smaller until there is only an infinitesimal current, and hence no effect at all.

(9906) W. H. R. asks: While the question of lubricating the sides and bottom of a ship by forcing air under the ship is being discussed, permit me to describe an experiment I made in this line a few years ago. When this idea of air lubrication first came to me I thought perhaps I had made a great discovery, and would have to build a small ship to prove it, but I soon found an easier and cheaper way of proving the value of air lubrication. I made a hollow pendulum, having a hollow stem, and small holes in the bottom of the pendulum disk; then I fastened a rubber tube on the end of the stem, and swung the disk in a dish of water. The pendulum was set in vibration, and the time noted that it took to come to a complete standstill. Then it was again set in vibration while air was being blown through the tube into the disk, and bubbling out through the small holes in the bottom of the disk, and the time was noted that it took for the pendulum to come to rest. The apparatus was very crude, but the result of the experiment did not show any marked advantage of air lubrication. In fact, as well as I remember, the pendulum would stay in motion just as long without air lubrication as with it; at any rate, the difference was so slight that one could not detect it without a timepiece, and I did not think it would warrant me in going to the expense of building an experimental ship, especially when the extra power consumed in forcing air under water was considered. I wish someone who has a laboratory would perform this experiment with every scientific precaution, and let your readers know the exact value of air lubrication. There is also another experiment I would like some scientist to perform. Let him make a searchlight that can be revolved very rapidly, and then determine the candle-power it would produce in all horizontal directions when revolved at various velocities compared with its original candle-power in one direction, when not revolving; also the amount of power consumed in revolving it at the various velocities. An impression of light is said to remain in the eye one-eighth of a second, and therefore if the searchlight turns fast enough, its light would seem continuous, and have a certain definite candle-power. I have made some experiments with a whirling card disk, having a perforation in it through which the sunlight passed. The area illuminated through the perforation was not as bright as the area illuminated by continuous sunlight, and for this reason I do not know whether or not it would be possible to increase the candle-power of a lamp by putting its energy in the form of a rapidly-revolving searchlight. If these experiments have not already been performed, I hope someone will try them, and publish the results. If they have been performed, and results published, will the SCIENTIFIC AMERICAN kindly advise as to where such information can be found? A. We are doubtful whether air lubrication of a vessel moving through the water on a small scale would furnish any data of value regarding its use on a large scale. Nor do we think air lubrication would prove beneficial enough to pay for its cost. The principal resistance to the motion of a ship through the water is not the friction of the water, but is the work required to move a weight of water equal to that of the ship out of the path every time the ship moves its own length. As to the measurement of the candle-power of electric lamps, many photometers are constructed to measure while the lamp is in rotation, as our correspondent proposes. The candle-power can be measured at any angle desired, and thus the mean spherical candle-power be determined. We do not know any special publication of such measurements, since they are in common use in lamp factories for the rating of incandescent lamps. Arc lamps are rated better by the watts consumed than by candle-power.

(9907) C. J. A. asks: I have several sal-ammoniac batteries which I charged according to the directions. After doing so I began using them after a reasonable length of time, which I allowed for the sal-ammoniac to dissolve. They were not used very much, so I know I did not use all their strength. They gradually became weaker and weaker. I took them and stirred them up, and they were as strong as ever. What had I best do with them to keep the sal-ammoniac from settling and not dissolving as it ought to? A. You should not have any undissolved sal-ammoniac in your cell. Dissolve nearly all the water can hold, and fill the cell with this liquid. The cell will then run its best. This cell, we presume you are aware, should not be used for continuous service. It is only to be used for interrupted service, such as ringing bells, telephone work, etc. It will not run a motor for any length of time. When crystals form on the zincs, these are not sal-ammoniac at all.

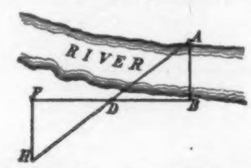
(9908) J. B. asks: 1. Would you let me know through your paper the formula of a solution acting upon carbon and zinc, which will produce about four volts to a cell? Also what will be the amperes of the current? A. No zinc-carbon cell can give four volts. The best to be had give about two volts. These are the chromic acid cells. See SUPPLEMENT 792, price 10 cents. 2. The name and price of a book which gives different formulas and the method of determining the volts and amperes of a cell, by ordinary arithmetic, for beginners. A. Cooper's "Primary Batteries," price $4, is very full upon the subject.

(9909) H. asks: Can you explain to me simply and in a few words why the trade winds in the northern hemisphere are deflected toward the west, while the prevailing westerlies are deflected toward the east? A. It is by no means easy to explain in a few words why the winds of the earth blow as they do. The subject occupies much space in the physical geographies, to which we would refer you. It may be said that the trade wind is a constant flow of air from north to south, because of the heat of the equatorial regions. As this air is passing from a region of slower to a region of more rapid rotation of the earth, it follows that the air has a slower eastward motion in the place to which it has come than the surface of the earth beneath it has. This causes the air to seem to come from the northeast. Similar reasoning applies to the prevailing westerlies, since these are return currents from the northeast trades. The air is moving from south to north, and has thus a more rapid easterly motion than the earth under it, which causes the air to seem to come from a more westerly direction than it actually is flowing.

(9910) E. H. W. asks: 1. What are specifications for winding 20-ohm Morse sounders? Is cotton or silk single or double covered wire used? A. A 20-ohm sounder is usually wound with No. 25 B. & S. single silk-covered wire, 14 layers to 67 convolutions to each layer. See Maver's "American Telegraphy," page 69, price $2. 2. How could a Eureka sounder (5 ohms) be rewound to 20 ohms resistance, having about 1,880 convolutions of wire? A. A Eureka sounder, 5 ohms, can be rewound to 20 ohms as in last question. 3. What kind and how many open-circuit cells (not Fuller) should be used on a telegraph line with two 20-ohm sounders, and a line resistance of 16 ohms? How many gravity cells should be used on a line of the same proportions? A. To separate a sounder to give a good, audible click, about one-quarter ampere is found necessary. Your line has 56 ohms, to which the battery resistance must be added. Calculation shows 16 gravity cells to be needed, although a smaller number may work the lines with sufficient strength or audibility. The gravity cell is the most satisfactory for such uses. Of open-circuit cells some form of the Leclanché type is formed, and of these ten cells will furnish you the necessary current, when they are in good condition.

(9911) M. F. C. asks: 1. I have a small induction coil, the condenser of which is 26 sheets of tinfoil, size 2 x 4 in. These are the words of Avery's "Elements of Natural Philosophy": "One object of the condenser is to prevent the spark otherwise produced at the break-piece of the primary circuit." My coil sparks heavily at the break-piece, which is a file and a piece of steel. Is my condenser too small? A. We think your condenser is too small. Try making it twice as large. One who is building a coil should have a book to go by. Norrie's "Induction Coils" is a reliable book, which we send for $1. 2. Can a Leyden jar be charged from an induction coil giving a ⅛ to ¼ inch spark? If so, how? A. Small Leyden jars can be charged with a small coil. Connect the outside of the jar to one pole of the coil, and hold the discharging rod tipped with a small brass ball near the ball of the jar. Sparks will jump across, showing the charging of the jar. 3. Can a jar be charged from an electrophorus giving a ½-inch spark of negative electricity? A. It would be very slow and tiresome work to charge a Leyden jar with an electrophorus. It is perhaps possible, but not profitable. You will find our SUPPLEMENTS 278, 279, 282, price ten cents each, very valuable upon these matters.

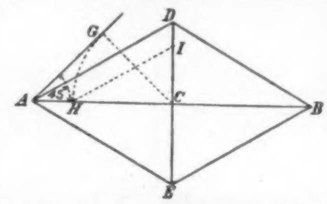
(9912) C. R. S. says: You give a method of measuring the width of a river without use of any instrument except measuring tape. Let me give you a better method. I refer to 9850, page 491. It requires a geometrician to remember your rule, while mine can be easily remembered, is more exact, and can even be used without the use of a measuring tape if one can step off distances with a fair degree of accuracy. Rule: Select a tree on the opposite bank as at *A*, and place a stake on the near bank as *B*. From *B* measure off a distance in a line perpendicular to the line *A B*, say a distance of one hundred steps or one hundred feet, and place a stake at this point *D*, then continue in same direction for



same distance to *F*. Then walk from *F* until the stake at *H* is in line with stakes *D* and *A*; the distance *F H* is equal to the distance *A B*. (Line *B D F* does not have to be perpendicular to *A B*, but may be in a convenient direction nearly perpendicular. The only error of any magnitude is the measuring of distances and getting line *F H* in the same direction (i.e. parallel) as line *A B*. Remember the distance *F D* is laid off equal to *D B*.

[Editorial Note: The rule which you give for estimating the width of a river is exceedingly simple and is correct. The only difficulty with this rule is the possibility of error caused by not getting the lines *A B* and *F H* exactly parallel. The rule which we previously gave is somewhat more complicated, but it is also more accurate, as it does not involve this source of error.]

(9913) T. W. McK. asks: Please show, in your Notes and Queries, by a figure and explanation, how to inscribe an ellipse in a rhombus whose angles are 60 deg. and 120 deg. A. To inscribe an ellipse in a rhombus of 60 deg. and 120 deg., proceed as in the figure below. Describe the rhombus and its diagonals.



Draw *AG*, making an angle of 45 deg. with *AB*, and let fall the perpendicular from *C* upon *CG*. With *CG* as a radius, describe the arc *GH*. *CH* is the semi-major axis of the ellipse. Draw *HI* parallel to *AD*, and *IC* is the semi-minor axis of the ellipse. From these the ellipse may be constructed.

(9914) J. W. C. asks: Is it a fact that when a ship at sea appears "hull down" to the naked eye, all of the ship can be brought into view, if a telescope is used? A. It is not a fact, although many believe it to be, that a ship, hull down, may be wholly seen through a telescope, that is, hull up again. We have often watched ships sailing hull down when at sea with a glass, and say from personal knowledge that a ship disappears below the horizon as if over a round earth, as it really is. What then is the basis for the other notion? For such an idea could not be established unless there were some reason behind it. It would seem to be this, as we surmise: The telescope makes distinctly visible the edge of the water and the details of the hull of the ship near the water, which are not distinctly seen by the unaided eye at such a distance, several miles at least. Thus it seems as if one were seeing farther down the hull than when looking without the aid of a glass.

(9915) P. H. W. asks: Kindly state why the months of the year are numbered, some with 31 days and some with 30, February with only 28? A. The arrangement of the days of our months is due to two Roman emperors, Julius and Augustus Cæsar. Julius Cæsar revised the calendar, making the common year to have 365 days, and every fourth year to have 366 days. The days of the year were distributed among the months, so that the odd months, beginning with January, had 31 days, and the even months had thirty days, except leap February, which had 29 days in common years and in leap years had 30 days. He also gave his name to the month of July. The months following were named from numerals. Augustus Cæsar followed Julius, and gave his name to the sixth month, August, and in order to get 31 days for it, so that it should be as long as July, named for Julius, he took a day from February and placed it in August. This brought three months with 31 days together. To remedy this Augustus changed September and November to 30 days and October and December to 31 days. Thus our peculiar arrangement of days in the months is because of the vanity of Augustus Cæsar.

(9916) I. A. R. asks: Will you please account for the universal idea among seafaring men that ice sinks? I can find no theory to substantiate the opinion, but two out of every three people will declare that they have seen ice sink. Many intelligent men have voiced this same opinion—men who know that ice is lighter than water. Any information you may give will be greatly appreciated by myself and others who are interested in the discussion. A. We can not suggest any reason for the idea that ice disappears by sinking, which is prevalent among sailors.

NEW BOOKS, ETC.

ECONOMIC GEOLOGY OF THE UNITED STATES. By Heinrich Ries, A.M., Ph.D. New York: The Macmillan Company, Ltd., 1905. 12mo.; pp. 435. Price, $4.60 net.

The present work is designed as a text book for use in colleges. In the preparation of the manuscript, all available sources of information have been freely drawn upon. The mode of arrangement is markedly different from that found in other books on the same subject, in that the non-metallic minerals are discussed first, and the metallic minerals last. The maps, sections, and illustrations are numerous and well-executed.

THE OYSTER. A Popular Summary of a Scientific Study. By William K. Brooks, Ph.D., LL.D. Baltimore: Johns Hopkins Press, 1905. 12mo.; pp. 225. Price, $1 net.

This book was written for the information of all who care for oysters—no matter whether their point of view be that of providers or consumers—for the oyster man, the money-maker, the housekeeper, the editor, or the student of natural history. So well is the book written that many parts of it are as fascinating as a story. The author of this volume is well known in all scientific circles as an accurate, clear-sighted, and trustworthy observer.

RADIO-ACTIVITY. By E. Rutherford, D.Sc., F.R.S., F.R.Sc. Cambridge (England) University Press. 8vo.; pp. 580. Price, $3.50.

The author has endeavored in this work to give a complete and connected account from a physical standpoint of the properties possessed by the natural radio-active bodies. Although the subject is comparatively a new one, our knowledge of the properties of radio-active substance has advanced with great rapidity and there is now a very large amount of information on the subject scattered through the various scientific journals. The phenomena exhibited by the radio-active bodies are extremely complicated, and some form of theory is essential in order to connect, in an intelligible manner, the mass of experimental facts which have now been gathered. Prof. Rutherford has advanced the theory that the atoms of the radio-active bodies are undergoing spontaneous disintegration.

So rapid has been the advance in the literature on radio-activity that a second edition of this work has been called for. The book is a serious discussion of a most interesting physical phenomenon.

CHIMICA DELLE SOSTANZE COLORANTI. Teoria ed Applicazione alla Tintura delle Fibre Tessili. Dal Dott. Arturo Pellizza. Milan: Ulrico Hoepli, 1905. 32mo.; pp. 480.

SUBJECT LIST OF WORKS ON AGRICULTURE, RURAL ECONOMY, AND ALLIED SCIENCES. In the Library of the Patent Office. London: Published at the Patent Office, 1905. 16mo.; pp. 424.

ELECTROMAGNET THEORY OF LIGHT. Part I. By C. E. Curry, Ph.D. London: The Macmillan Company, 1905. 12mo.; pp. 400. Price, $4.

In the present work Prof. Curry treats of the more familiar phenomena explained by Maxwell's theory, and has reserved for Part II those phenomena which this theory fails to satisfactorily explain. Particular stress is laid on the development of the fundamental laws of optics, rather than on the many secondary laws derived therefrom, which have little to do with our conception of the nature of light. The beginning of each chapter presents a brief historical sketch of the subject-matter treated, and as far as possible each chapter is developed independently of the preceding ones. To the end of each chapter examples pertaining to matter treated in the text have been added, and should be found very useful to the reader.

THREE-COLOR PHOTOGRAPHY. By Arthur Freiherrn von Hübl. Translated by Henry Oscar Klein. London: A. W. Penrose & Co., 1904. 8vo.; pp. 144. Price, $3.50.

This book was originally published in German, in 1897, and represented the first work which entered into all details concerning three-color photography. The English edition, translated by Mr. Henry O. Klein, has been completely revised and brought up to date. Special attention is given to photographic color decomposition, and the color scale which is attached will enable anyone to adjust his own filters. Part II of the book is devoted to the theory and practice of three-color printing, its several chapters thoroughly explaining the art of three-color printing, the sensitizing of photographic plates, use of light filters, selection of printing inks, etc. The book contains much valuable information.

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC AND PHOTOGRAPHERS' DAILY COMPANION. Edited by George E. Browne, F.I.C. London: Henry Greenwood & Co.; New York, G. Gennert, 1906. 16mo.; pp. 1,134.

The British Journal Photographic Almanac comes to us this year if anything a little more portly than usual. The old established arrangement has been revised so far as seemed necessary to make every bit of the text more easy of reference. The contents include a calendar, directory of photographic societies, obituary notices, and contributed articles. Under the heading "Epitome of Progress" appear chapters on apparatus and equipment, photographing various subjects, negative processes, printing processes and color photography. The formulæ for the principal photographic processes are features to be found in most photographic almanacs, but in the case of the volume before us they are particularly noteworthy because of their excellent arrangement. In the end of the book will be found a very good set of tables for the use of photographers.

THE PRACTICAL ENGINEER ELECTRICAL POCKETBOOK FOR 1906. Manchester, England: Technical Publishing Company, Ltd. No date. 24mo.; pp. 440. Price, 60 cents.

The Practical Engineer Electrical Pocketbook is always a welcome visitor. It is very compact, far more so than American pocketbooks, which are apt to be just too large to go in the pocket. There is little utility in this form of book unless it can be readily carried in the pocket, and we always have the dual penalty of both fine type and bulkiness. The present issue contains all the valuable matter of the preceding issues with additional tables and formulæ as well. It is an excellent book.

LABORATORY EXPERIMENTS TO ACCOMPANY OUTLINES OF INORGANIC CHEMISTRY. By Frank Austin Gooch and Claude Frederic Walker. New York: The Macmillan Company, 1905. 8vo.; pp. 104. Price, 50 cents.

AIR AND GAS COMPRESSING MACHINERY. London: Worthington Pump Company, Ltd., 1905. 12mo.; pp. 175.

It is seldom that we review a catalogue, but the one before us contains so much useful information, that we feel like departing from our general rule. It is illustrated with very clear diagrams, showing the actual operation of the mechanism employed. The subjects of air lifts, pneumatic hoists, etc., are also treated. There is published considerable information relative to compressed air.

RADIUM AND RADIO-ACTIVE SUBSTANCES. By Charles Baskerville, Ph.D. Philadelphia: Williams, Brown & Earle, 1905. 12mo.; pp. 164; 67 illustrations. Price, $1.

This book is written to fill the demand for non-mathematical work on the subject of radium. Excellent treatises have recently appeared on radio-activity as viewed from the standpoint of the physicist, and other books as viewed from the standpoint of the chemist; but the present work relates particularly to the subject as applied to medicine, and aims to present a fairly clear conception of our present knowledge of these phenomena in a simple manner, such as will be valuable to physicians who have neither time nor opportunity to study larger works.

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Timber jack, J. M. Williams 814,105
Time recorder, workman's, D. Hepp 814,602
Tin or tin and lead, recovering, J. C. Taliaferro 814,334
Tire, F. W. O'Connor 814,560
Tire, elastic metallic, A. Pesst 814,161
Tire, pneumatic, F. G. McKim 814,068
Tire, resilient vehicle, J. F. Rau 814,164
Tire, sectional, F. G. Urfer 814,175
Tire shoe, E. Krebs 814,143
Tire shoe, pneumatic, J. W. Hyatt 814,377
Tobacco pipe, F. M. Holes 814,045
Toilet article, F. A. Steele 814,406
Toilet articles, etc., combined frame and handle for, L. Van Gale 814,415
Tool, combination, H. A. Hamilton 814,039
Tool, hand controlled, H. A. Clifford 814,020
Tower cap, F. T. Zimmerman 814,106
Toy, Linderman & Corson 814,463
Toy building block, J. B. Given 814,367
Track fastener, C. L. Darbower 814,525
Track sanding apparatus, B. D. Willits 814,256
Tramway bucket and rope clip, B. C. Riblet 814,622
Trap. See Animal trap.
Trap, R. L. Flint 814,527
Trap for sinks, bath tubs, and the like, A. Savard 814,481
Trolley catcher, S. F. Pierce 814,075
Trolley conductors, supporting structure for, G. Westinghouse 814,339
Trousers hanger, A. Chelberg 814,429
Truck, railway car, G. C. Stewart 814,400
Tub, tank, and other like receptacle, H. Romunder 814,625
Tug, hame and breeching, I. B. Martin 814,554
Tumbling barrel, A. F. Schroeder 814,166
Turbine, elastic fluid, G. Belluzzo 814,423
Turbine engine, gas, W. E. Clark 814,187
Turbines, nozzle for elastic fluid, F. R. C. Boyd 814,425
Turbines, nozzle for elastic fluid, C. Bradway 814,426
Turbines, nozzle for elastic fluid, G. Meyersberg 814,466
Turbines, nozzle for elastic fluid, R. H. Rice 814,477
Twine and thread cutter, Myer & Koeniges 814,153
Twine binder, B. Levison 814,462
Type packing mechanism, F. A. Johnson 814,048
Typewriter, A. A. Dey 814,119
Typewriting machine, E. G. Latta 814,144
Typewriting machine, Merritt & Barron 814,310
Typewriting machine, Robbins & Hyatt 814,623
Umbrella, G. K. Garrett 814,035
Valve, C. E. Simpson 814,402
Valve, diaphragm, D. F. Morgan 814,063
Valve, filter, C. Hungerford 814,136, 814,211
Valve for air brake systems, J. H. Blecco 814,350
Valve for automobile torpedoes, starting, F. M. Leavitt 814,655
Valve for steam engines, exhaust, W. H. Dyer 814,435
Valve gear for steam and other fluid pressure engines, W. H. Collier 814,275
Valve mechanism for engines, cut off and reversing, W. Willis [illegible]
Valve mechanism for internal combustion engines, H. Austin 814,421
Vegetable cutter, J. S. Urban 814,577
Vehicle brake, J. W. McIlvain 814,559
Vehicle wheel, F. A. Seiberling 814,087, 814,088
Vehicle wheel, G. H. Williams 814,580
Vehicle wheel, resilient, J. W. Roddy 814,479
Vehicles, buffer for use on motor, F. R. Simms 814,171
Veil holder, M. W. Lee 814,221
Vending machine, L. C. Spooner 814,332
Veneering machine, R. H. Lyon 814,382
Veneers, process and apparatus for preparing and cutting, G. S. Mayhew 814,062
Ventilating apparatus, E. L. Parrish 814,021
Ventilator, W. T. Cottier 814,357
Ventilator, Harrington & Hedge 814,651
Vessels, apparatus for marking sunken, F. W. Johnson 814,536
Vessels, means for locating and raising sunken, W. G. Cain 814,517
Violin, O. H. Lemberg 814,540
Vise, hand, S. J. Welter 814,633
Vise, pipe, McGahan & Ascher 814,228
Wagon bolster and stake construction, E. Einfeldt 814,436, 814,526
Wardrobe, L. Komorowski 814,457
Washing machine, H. P. Pflum 814,394
Watchcase, J. T. Pendlebury 814,232
Water by electrolysis, apparatus for decomposing, W. F. M. McCarty 814,155
Water for decoloration, process and apparatus for testing, L. Gerard 814,036
Water purification system, J. F. Wixford, 814,180, 814,634
Weapons, pocket holder for, O. Freyer 814,599
Weather strip, C. A. Pike 814,076
Wells, device for removing rings from, W. J. Wagner 814,338
Wheel construction, F. P. Prendergast 814,077
Wheels, mounting or suspension for vehicle, C. W. Fulton 814,198
Windmill, A. Geoffroy 814,283
Windmill, P. H. Hanchett 814,600
Window, J. L. Mesker 814,616
Window and screen attachment, B. Mohr 814,468
Window fastener, R. G. Fraser 814,439
Window retaining apparatus, G. H. Parker 814,317
Window stop and burglar alarm, G. H. Parker 814,314
Window, swinging, G. H. Parker, 814,315, 814,316
Wire goods, machine for making, J. C. Perry 814,392
Wire stretcher, woven, W. Cue 814,024
Wood scraping tool, G. D. Smith 814,404
Work holding attachment, Fertig & Knoll 814,306
Wrench, M. B. Griswold 814,201
Wrench, G. W. Austin 814,348
Wrench, J. F. Tiner 814,575
Zinc formaldehyde hydrosulfite (S.), making, E. A. Fourneaux 814,031

Zinc formaldehyde hydrosulfite (S.), making basic, E. A. Fourneaux	814,072
Automobiles, frame of radiators for, A. E. Schaaf	37,881

DESIGNS.

Badge, C. M. Waite	37,864
Badge, C. J. Diegea	37,865
Bodkin, J. H. Crosby	37,871
Bread tray, W. Mischler	37,868
Cigar band, L. C. Wagner 37,872,	37,873
Curtain, grille, F. E. Erickson	37,882
Display cabinet, picture, G. E. Knowles	37,879
Display case, E. Faber 37,877	37,878
Gas burner, incandescent, V. F. von Lossberg	37,880
Lace, levers, C. W. Birkin	37,883
Pencil, E. Faber 37,869,	37,870
Ribbon, C. P. Schlegel .... 37,884 to	37,886
Rosary, H. F. Nehr	37,875
Rosary, B. Teubner	37,876
Spoon handle, E. Mehesy, Jr.	37,867
Spoon or similar article, J. R. Bookwalter	37,866
Tablet or lozenge, J. Peterson	37,874

TRADE MARKS.

Abrasive material, carborundum, Carborundum Company	50,104
Ale, ginger, G. F. Hewett Co.	50,267
Antiseptic, R. S. Walker	50,256
Antiseptic compound, P. Harkansson	50,233
Asphalt, Warren Chemical & Manufacturing Company	50,084
Axes, hatchets, and adzes, Collins Company	50,138
Baking powder, Hulman & Co.	50,272
Bearings, ball, Hess-Bright Manufacturing Co.	50,105
Beef extract, Cudahy Packing Co.	50,296
Beer, lager, F. A. Poth & Sons	50,069
Belting, leather, Patterson, Gottfried & Hunter	50,157
Bitters, Frankel, Regenthal and Damler	50,170
Blankets, wool, S. Levi	50,178
Bluing, laundry, Russ Company	50,103
Boots and shoes, leather, F. Mayer Boot & Shoe Co.	50,129
Boots and shoes, leather, I. Levinstein	50,132
Boots and shoes, leather, Lynchburg Shoe Co.	50,133
Boots and shoes, leather, Nesmith Shoe Company	50,134
Boots and shoes, leather, J. H. Cross	50,147
Boots and shoes, leather, I. Levinstein	50,155
Boots and shoes, leather, P. W. Minor & Son	50,283
Boots and shoes, liquid dressing for, C. L. Hauthaway & Sons	50,066
Boots and shoes, liquid dressing for leather, C. L. Hauthaway & Sons	50,067
Brake shoes, American Brake Shoe & Foundry Company	50,122
Brandy, H. Campe & Co.	50,269
Brooms, American Broom & Brush Co., 50,141, 50,142, 50,200 to	50,202
Canned salmon, J. G. Megler 50,281,	50,282
Canned sardines, C. B. Mitchell	50,284
Canned vegetables and fruits, S. J. Seneca	50,291
Cards, playing, New York Consolidated Card Company .... 50,073 to	50,077
Cards, playing, United States Card Playing Co. 50,078,	50,079
Cards, playing, New York Consolidated Card Company .... 50,106 to	50,114
Cards, playing, United States Playing Card Co. 50,116,	50,117
Catchup, tabasco and tomato, Joseph Campbell Company	50,239
Cement, Portland, A. Clarke	50,090
Chains, fobs, chatelaines, and chain trimmings, C. R. Harris	50,130
Champagne and still wine, F. Korbel & Bros.	50,095
Cheese, Phenix Cheese Co.	50,286
Chilli sauce, tabasco sauce, and salad dressing, Joseph Campbell Company	50,240
Chocolates and bonbons, R. L. Perry Co.	50,287
Cigars, E. H. Gato Cigar Company	50,068
Cigars, P. E. Watson	50,086
Cigars, W. Boucher	50,088
Cigars, E. H. Gato Cigar Company	50,083
Cigars, J. Weinreich	50,119
Cocktails, George F. Hewett Co.	50,171
Cocoanut, desiccated, Citizens' Wholesale Supply Co.	50,251
Coffee, Hulman & Co.	50,236
Coffee, Independence Coffee and Spice Co.	50,299
Corsets, Kabo Corset Company	50,176
Corsets, Royal Worcester Corset Co.. 50,187	50,188
Cotton cloth buff wheels, Williamsville Manufacturing Company	50,120
Cotton damask, Rosemary Manufacturing Company	50,186
Cotton duck, Hogansville Manufacturing Company	50,174
Cotton duck, Mount Vernon-Woodberry Cotton Duck Company	50,181
Cotton duck, Mount Vernon-Woodberry Cotton Duck Company	50,182
Cotton piece goods, Catlin & Co.	50,169
Court plasters, liquid substitute for, Douglas Manufacturing Company	50,252
Croustades, F. Beaumont	50,218
Cycle saddles, J. B. Brooks & Co.	50,131
Dentifrices, liquid, American Peroxide and Chemical Company	50,250
Disinfectants, liquid, M. E. Platt	50,246
Dyeing preparation, E. C. Foster	50,229
Dyestuff, Cassella Color Company.... 50,221,	50,222
Envelopes, Transo-Paper Company	50,165
Fabrics, drapery and upholstery textile, Eddystone Manufacturing Company	50,192
Fabrics, printed and dyed textile, Eddystone Manufacturing Company	50,193
Files and rasps, Carver File Company	50,089
Files and rasps, Nicholson File Company, 50,135,	50,136
Files, rasps, and handles and holders therefor, Nicholson File Company	50,137
Fire extinguishing apparatus, automatic, International Sprinkler Co.	50,274
Fish, dried, smoked, pickled, salted, and canned, W. T. Shute	50,247
Flavoring extracts, Jordan Stabler Co.	50,238
Flour, rye, Boutwell Milling and Grain Co.	50,294
Flour, wheat, Model Milling and Elevator Co.	50,303
Flour, wheat, Purcell Mill and Elevator Co.	50,304
Flour, wheat, Thornton & Chester Milling Co.	50,305
Flour, wheat, Wm. A. Coombs Milling Co.	50,322
Food, blood, nerve, and brain, M. H. Grossman	50,231
Fresco, calcimine, and wall paper cleaner, Climax Cleaner Manufacturing Co.	50,092
Fruits, dried and evaporated, Griffin & Skelley Co.	50,290
Furs for wearing apparel, manufactured, C. G. Gunther's Sons	50,144
Gin, H. R. Myers	50,183
Gin, National Distilling Co.	50,184
Glassware, pressed, A. H. Heisey & Co.	50,121
Gloves and mittens, Joseph N. Eisendrath Co.	50,213
Grease, Kent Lubricating Co.	50,100
Gum, chewing, American Chicle Co.	50,258
Hair restoratives, S. R. Van Duzer	50,254
Hair restorer, S. R. Van Duzer	50,255
Harness, Studebaker Brothers Manufacturing Co.	50,210
Hosiery, J. Blood & Co	50,143
Hosiery, O'Callaghan & Fedden	50,156
Hosiery, Sheboygan Knitting Co.	50,163
Insulating compound, rubber, Okonite Co.	50,139
Lacing hooks and lacing studs, Tubular Rivet and Stud Co.	50,214
Lard, Cudahy Packing Co. 50,295,	50,297
Laxatives, Paracamph Co.	50,253
Leather, sole, S. H. Frank & Co.	50,209
Liniment, J. J. Walsh	50,307
Links, sleeve buttons, collar buttons, studs, and blouse button sets, Standard Button Co.	50,190
Lye and potash, Eagle Lye Works.. 50,226,	50,227
Macaroni, spaghetti, vermicelli, and noodles, Anger Baking Co.	50,217
Magazine, monthly, Review Publishing Co.	50,158
Malt extract, Valentin Blatz Brewing Co.	50,060
Malt extract, Bernheim Distilling Co.	50,087

Medicinal preparation, liquid, Henry Bell Chemical Co. 50,270
Medicine for certain named diseases, H. O. Hurley 50,237
Medicine for diphtheria and rheumatism, F. E. Bonyman 50,220
Medicine for stopping excessive perspiration F. Boettger 50,219
Metal polish, Hinds & Coon.......... 50,070
Milk and evaporated cream, condensed, Adam Roth Grocery Co. 50,257
Mince meat, condensed, Merrell-Soule Co.... 50,242
Mineral waters, Solon Vendophone Co...... 50,292
Nails, upholsterers', Traut & Hine Manufacturing Co. 50,115
Needles, C. H. Crowley 50,091
Oil, antiseptic healing, Paris Medicine Co., 50,244, 50,245
Olives, preserved, C. Gulden 50,232
Organs, W. W. Putnam & Co.......... 50,072
Overalls, H. W. Carter & Sons......50,145, 50,146
Packing, flax, Dunham, Carrigan & Hayden Co. 50,148
Paper, blotting, Standard Paper Manufacturing Co. 50,159
Paper, sheathing, W. H. Rankin Co....... 50,083
Pencils, lead, Eagle Pencil Co.......... 50,127
Penholders, Eagle Pencil Co.......... 50,128
Periodical, A. E. Dunn 50,149
Pistols, Colt's Patent Fire Arms Manufacturing Co. 50,125
Pitch, Warren-Ehret Co. 50,085
Plaster, calcined, C. Tomkins 50,118
Plasters, corn killing, M. R. Kelly & Co.... 50,099
Popcorn, Albert Dickinson Co. 50,249
Powder, worm, Dr. Hess & Clark.......... 50,235
Publication, annual, Industrial Press 50,161
Pull sockets, Harvey Hubbell 50,234
Remedies for malarial diseases, Paris Medicine Co. 50,285
Remedies or purifiers, blood, A. L. Filleau.. 50,228
Remedy for asthma, Tafts Asthmalene Co.. 50,248
Remedy for diabetes, Renal Pharmacal Co.. 50,289
Remedy for epilepsy, A. K. Mandis...... 50,241
Rheumatic cure, Old Veteran Rheumatic Cure Co. 50,243
Rheumatic cure, Renal Pharmacal Co...... 50,288
Rubber heels for boots and shoes, P. W. Minor & Son 50,206
Rubber nipples for nursing bottles, Seamless Rubber Co. 50,162
Sheetings, Carey, Bayne & Smith Co....... 50,168
Shirtings and sheetings, cambrics, and long cloth, G. Willis & Co.........50,309 to 50,320
Shirtings, sheetings, cambrics, and long cloth, G. Willis & Co.......... 50,172
Shoes, men's leather, Hamilton-Brown Shoe Co. 50,150
Silk and mixed cotton and silk piece goods, B. Makover Co. 50,191
Silks and satins, William Skinner Manufacturing Co. 50,198
Soap, pumice, Iowa Soap Co.......... 50,071
Spices, E. R. Durkee & Co.......... 50,225
Tablets for diseases of the entire digestive tract, Illinois Laboratories 50,300
Talking machine records, Victor Talking Machine Co. 50,081
Talking machines and parts thereof, Victor Talking Machine Co. 50,082
Thread, Nonotuck Silk Co. 50,194
Threads, cotton, silk, hemp, and other fiber, Singer Manufacturing Co. 50,195
Tobacco, plug, cut plug, and smoking, J. G. Dill 50,098
Toilet cases, traveling, W. E. Disbrow..... 50,126
Tonic, Colburn, Birks & Co.......... 50,224
Tonic or nutriment, blood, Charles Hammesfahr Co. 50,223
Trees, peach, Sneed & Wood.......... 50,212
Vinegar, spirit, Chas. E. Meyer & Co...... 50,262
Vinegar used for pickling, Chas. E. Meyer & Co. 50,261
Violin, guitar, zither, and banjo strings, S. Blumenthal 50,123, 50,124
Watches, Elgin National Watch Co....... 50,094
Whalebone, natural and artificial, D. Hone. 50,204
Whiskies, Meadville, Pennsylvania Distilling Co. 50,280
Whisky, United Wine and Trading Co..... 50,140
Whisky, Hurley & Co. 50,151
Whisky, I. Michelson & Bros. 50,152
Whisky, H. Kahn 50,153
Whisky, L. & A. Scharff 50,154
Whisky, Weideman Co. 50,164
Whisky, Blumenthal & Bickart 50,167
Whisky, H. W. Huguley Co. 50,173
Whisky, Jesse Moore Hunt Co. 50,175
Whisky, J. & E. Mahoney 50,179
Whisky, Maryland Distilling Co. 50,180
Whisky, P. J. Bowlin Liquor Co.......... 50,185
Whisky, S. Grabfelder & Co. 50,189
Whisky, Wm. Bergenthal Co. 50,196
Whisky, William H. Lee & Co.......... 50,197
Whisky, A. A. Wolf & Co.......... 50,199
Whisky, Hartman, Goldsmith & Co. 50,203
Whisky, F. W. Hunt & Co.......... 50,205
Whisky, Mueller, Wathen & Kobert 50,207
Whisky, Rock-Spring Distilling Co. 50,208
Whisky, W. P. Squibb & Co.......... 50,211
Whisky, J. D. Ulrich 50,215
Whisky, J. T. S. Brown & Sons.......... 50,259
Whisky, Dreyfuss, Weil & Co. 50,263
Whisky, M. L. Eppstein 50,264, 50,265
Whisky, J. & A. Freiberg 50,266
Whisky, H. Groves Sons 50,269
Whisky, F. W. Hunt & Co.......... 50,271
Whisky, Hurley & Co. 50,273
Whisky, Jas. E. Pepper & Co.......... 50,275
Whisky, Kaufmann, Baer & Co. 50,276
Whisky, L. Levy & Co. 50,277
Whisky, S. Lieberman 50,278
Whisky, J. A. Magnus & Co.......... 50,279
Whisky, W. P. Squibb & Co.......... 50,293
Whisky, I. Trager Co. 50,301
Whisky, McCart Mosset Co. 50,302
Whisky, N. M. Uri 50,306
Whisky, D. Wise & Co. 50,321
Whisky, malt, Wichman, Lutgen & Co..... 50,308
Whisky, rye, Henry B. Gilpin Co....50,160, 50,298
Wine, Italian Swiss Colony 50,096, 50,097
Wine, P. J. Bowlin Liquor Co.......... 50,101
Wine, Henry Block Co 50,268
Wine, fruit, L. Rosenzweig 50,102
Woolen cloths, American Woolen Co....... 50,166
Yarns of all descriptions, Wm. H. Horstmann Co. 50,216
Yeast powder, Rumford Chemical Works... 50,290

LABELS

"Ballard's Heleo-Rosa," for a preparation for the cure of dandruff, A. Ballard.... 12,699
"Bohemian," for beer, Milwaukee Lithographing Co. 12,693
"Brainalgine," for medicine, T. E. Smith.. 12,697
"Century Maidens," for cigars, J. F. O'Donnell 12,695
"Comparto," for sponges, A. Moses Sons & Co. 12,700
"Denol," for tablets, T. A. Allen.......... 12,698
"Malt Juice," for malt juice, C. H. von Klein 12,694
"Radium-I-See," for medicine, Wolverton's N. Y. Co. 12,696

PRINTS.

"A A Dentifrice Cream," for a dentifrice, Atlanta Antiseptic Co. 1,589
"Imperial Hats for 1906," for hats, Samuel Mundheim Co. 1,587
"Men's Apparel," for men's apparel, W. C. Both 1,588
"Star Enamel and Sapolin Varnish Stain," for enamel and varnish, Gerstendorfer Bros. 1,591
"Wrapper for Playing Cards," for playing cards, Willis W. Russell Card Co....... 1,590

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